Journal of the Society of Arts.

FRIDAY, NOVEMBER 30, 1855.

SECOND ORDINARY MEETING.

WEDNESDAY NOVEMBER 28, 1855.

The Second Ordinary Meeting of the One Hundred and Second Session was held on Wednesday, the 28th inst., Dr. Lindley, F.R.S., in the chair.

The paper read was:—

THE GUMS AND RESINS OF COMMERCE.

BY P. L. SIMMONDS.

The subject which I have undertaken to open up for discussion this evening is one embracing so many important articles of commerce, and extending over so wide a field of research, that I can scarcely hope to do common justice to any even of the great classes into which it naturally divides itself—much less to enumerate or particularise one-half of the various new gums and resins which I should desire to bring more prominently into notice. Any one of these gums or resins would have formed ample field for investigation and inquiry of itself, taking it in its several relations of origin, sources of supply, mode of procuring, quantity obtainable, price, chemical composition, and probable utility, as compared with other similar exudations and their commercial uses.

But in taking a rapid survey of the whole group of gummy and resinous exudations, any such close and full description would be utterly impossible—and as it is, I shall have to pass over much of the information I have arranged, leaving it for the quiet perusal and future consideration of those who feel greater interest, in its more extended form in the columns of the Society's *Journal*.

In the mode of treating my subject I hesitated at first as to whether it might not be useful to go over each quarter of the globe separately, giving distinct accounts of the gummiferous plants and products of Europe, Africa, Asia, Australia, and America. But on reflection I found that this would entail much repetition, and I am, therefore, necessitated to fall back on the conventional classification usually adopted of true gums, resins, gum resins, oleo resins, and elastic gums, and I hope to be able to furnish something new to our current stock of information under each of these heads.

The importance of this class of commercial products will be better estimated by the statistics I shall be able to furnish of the trade, brought down to within the last year or two.

That there has long been a want of some more detailed information on the gums and resins of commerce will not be denied, for, although much has of late years been done by the several local and metropolitan exhibitions to collect and diffuse correct information, we are still lamentably deficient in details as to the plants that produce very many; and the learned Professor who presides on this occasion, knowing himself how difficult it is to identify plants without the presence of the leaves, barks, and necessary adjuncts, will readily be able to excuse any accidental errors I have fallen into, which his more experienced judgment may be able to correct. Much information respecting the gum-bearing trees of commerce and their products is doubtless to be found scattered through many home and foreign scientific periodicals, but this bears rather on their medicinal value than on their commercial properties and uses in the arts and manufactures, and grave errors continue to be propagated in standard works from day to day; even in a publication of weight and influence like the "Encyclopædia Britannica," most of the details in the articles as given in the new edition (as far as it has proceeded,) are nearly reprinted verbatim as issued in its pages some thirty or forty years ago.

There is another work of assumed authority, where one would naturally look for some recent information as to the progress of discovery in new gums and their applications, viz., Dr. Ure's Dictionary of Arts and Manufactures, but in the last edition of 1853, the article "Gums" stands verbatim as it did in the editions fifteen years previous, brief and meagre in its character, while that on Resins has merely an addenda of a page to the previous stereotyped matter.

Everyone who brings the result of his researches and investigations to bear into the common stock, if he has been diligent and treated the subject fully and fairly, must contribute some few hints that may prove useful, and if I but succeed in doing this, I shall be satisfied.

I must premise that in order to assimilate my information to the erroneous nomenclature of city circles and commercial lists I am obliged to depart to some extent from the true scientific definition, and shall speak frequently of many substances as "gums" which are properly gum resins, or pure resins. Were I not to do this I should confuse many of those whom I see around me, and who have had to buy and sell by names which were erroneously given years ago, before chemical analysis had determined the true composition of many.

It has been well observed by Professor Solly (Jury Reports, p. 71), that "a great deal of practical inconvenience and confusion is caused by the indiscriminate manner in which the term *gum* is used in commerce and the arts. It would certainly be an advantage if the distinctions employed in scientific books were to be generally adopted by merchants and drug-brokers, the term gum being solely applied to those natural vegetable exudations which soften or dissolve in water, and yield a more or less perfect mucilage, but which are wholly insoluble in spirit; the term *resin* being applied to those fusible and combustible vegetable substances which are quite insoluble in water, but which soften and dissolve in ether, the 'essential oils,' and 'spirits of wine,' and the term *gum resin* being used to designate those mixtures of gum and resin which are intermediate in properties, and partake of the nature of each, being partially and imperfectly soluble both in water and in alcohol."

Gum, properly so called, is used in large quantities for a number of purposes in the arts. It is generally distinguished into soluble gum, or gum arabic, which readily and perfectly dissolves in water, forming a clear mucilage, and cherry-tree gum, or gum tragacanth, and those difficultly-soluble kinds of gum, which, though they soften easily, do not readily form mucilage. Gum is extensively used in finishing and giving lustre to crapes, silk goods, &c., by calico printers, shoemakers, and in other trades.

As instances of the immense traffic carried on in gums, I may state that one Liverpool firm imported in three years Gum Senegal to the value of £100,000. Gums to the value of 3¼ millions of francs have been shipped annually from Alexandria. The exports from Morocco reach to 250 or 300 tons, and India exports 1,500 or 1,600 tons.

The GUM ARABIC of commerce is the produce of various species of acacia, which yield this substance in considerable quantities, particularly *A. vera*, a native of Arabia and of Africa, from Senegal to Egypt, which supplies the finest qualities; *A. Arabica*, a smaller tree, common in India and Africa, which yields part of the Turkey and East India gum; the red pieces constituting the gum gedda and gum babool of commerce.

A. gummifera, a high, thorny tree, found near Mogador, the coast of Guinea, and in Arabia, furnishes what is known as Barbary gum, a darker variety.

A. Senegal yields part of the Senegal gum, the tears of which are usually in larger masses than *arabic*, of a darker colour, and more clammy and tenacicus. The trade in this variety is chiefly in the hands of the French, and we have imported supplies occasionally from France.

In the Cape colony gum is collected by the Kaffirs from a species of Acacia closely resembling *A. vera*, which Burchall, in his "Travels into the Interior," calls *A. Capensis*, the *A. karoo*, probably, of Hayne, Nies, and Ebermaier, which is abundant on the banks of the Orange River. It is of a pale yellow colour, and is not considered by the dealers so good as that obtained in the more northern parts of Africa.

The ordinary Cape gum of commerce exudes spontaneously from the bark both of the trunk and branches of the thorn tree (*Acacia horrida*, Willd).

A considerable trade was carried on by the Cape colonists a few years ago with Kaffirland for the gum gathered from the Mimosa tree. Waggon-loads were constantly being sent off to Port Elizabeth for shipment to the London market. It was extensively used by calico-printers, calenderers, makers of stationery, and in various industrial arts. The exports have declined from 4,876 cwts. in 1849 to 72 cwts. in 1853. The reason for this decline is curious. By mere accident it was discovered that a gum could be manufactured from potatoes or wheat. This article—now called British gum—dextrine, or gum substitute, has superseded the more expensive in almost every department of manufacture and art in which it was used—hence the demand for Kaffir gum is at an end. British gum is found to possess adhesive properties equal to Gum-arabic, being less liable to be affected by climate, it is therefore used for postage-stamps, envelopes, &c., as well as in manufactures, and it can be produced for less than one-fourth the cost.

Some fortunes have been made by the discovery, which originated in pure accident, and which is stated to have been made as follows :—

A fire took place in a manufactory of starch from potatoes, near Dublin. The burning building was deluged with water from the fire-engines, and the starch washed about in every direction. A man fell down into the flood of calcined starch and water, but thought no more of it until next morning, when dressing himself he found the legs of his trowsers, sleeves of his coat, pockets, and every other opening firmly obstructed. On examination he thought he had fallen into gum, but on revisiting the scene of the fire he discovered that the properties must be contained in the potato starch, and by a few simple experiments he made a discovery which has resulted in large profits.

According to the statement of Dr. Vaughan, of Aden. the acacia which yields gum arabic is generally a small shrub, of a dry and withered appearance; occasionally, however, it shoots out into a tree of from twenty to thirty feet high. The Somalis, on the north-east coast of Africa, collect the gum during the months of December and January. The process of obtaining it is extremely simple; long incisions are made in the stem and branches, from which the juice flows, and when dry is removed. After the gum of a district has been gathered, it is sewn up in goat skins, and brought on camels to the great Berbera fair, or to some of the smaller settlements on the coast, and thence shipped to Aden and India.

There are three descriptions of the gum, styled severally Felick, Zeila, and Berbera. None of the first-named, which is esteemed the best, finds its way to Aden, the mass being usually bought up by the Banians, or Hindoo merchants, and shipped direct to Bombay, where it realises about 50s. the cwt. The other two named varieties are called after the ports of shipment, and only fetch about half the price of the Felick gum. In 1851, 250 tons of gum-arabic passed through the Aden custom-house, the selling price there being about 24s. the cwt.

The local names for the gum-arabic, or Summuk, are adad, wadi, and anhokib, of which the anhokib is considered the best. It sells at Bunder Murrayeh for 1½ dollars per frasila of 20lbs. The tree is found on the mountain sides, in good red soil, and varies in height from ten to twenty feet. The inferior qualities of gums are sold at a much lower rate.

During the hot season the men and boys are daily employed in collecting gums, which process is carried on as follows:—About the end of February or the beginning of March, the Bedouins visit all the trees in succession, and make a deep incision in each, pulling off a narrow strip of bark for about five inches below the wound. This is left for a month, when a fresh incision is made in the same place, but deeper. A third month elapses, and the operation is again repeated, after which the gum is supposed to have attained a proper degree of consistency. The mountain sides are immediately covered with parties of men and boys, who scrape off the large clear globules into one basket, whilst the inferior quality that has run down the tree is packed separately.

The gum when first taken from the tree is very soft, but hardens quickly. Every fortnight the mountains are visited in this manner, the trees producing large quantities as the season advances, until the middle of September, when the first shower of rain puts a close to the gathering of that year. Large quantities of gum-arabic are collected by persons in the employ of the Egyptian government, and brought to Cairo in the caravans to be warehoused. The annual return occasionally reaches to 20,000 packages of 78 lbs. each.

In Morocco, about the middle of November, that is, after a rainy season, which begins in July, the gummy juice exudes spontaneously from the trunk and principal branches of the acacia tree. In about fifteen days it thickens in the furrow, down which it runs, either in vermicular (or worm) shape, or commonly assuming the form of oval and round tears, about the size of a pigeon's egg, of different colours, as they belong to the white or red gum tree. About the middle of December the Moors encamp on the border of the forest, and the harvest lasts six weeks.

The gum is packed in very large sacks of leather, and brought on the backs of bullocks and camels to certain ports, where it is sold to the French and English merchants. It is highly nutritious. During the time of harvest, of the journey, and of the fair, the Moors of the desert live almost entirely upon it, and experience proves that six ounces of gum are sufficient for the support of a man twenty-four hours.

Gum is largely collected in Central Africa, and sent to the coasts of the Mediterranean and the oceans. Gum-arabic and Senegal to the value of £120,000 are exported; other sorts of gums to the value of £12,000, and resins and varnishes to the value of £6,000. From Senegambia the quantity of gum exported is given at 25,000 quintals or cwt., of which 9,000 go to France, 6,000 come to this country, 4,000 go to Portugal and the United States, and about 6,000 are sent by the caravans of Fezzan and Morocco to other parts of Central Africa.

In the Indian bazaars, the products of a variety of trees are mixed and indiscriminately vended as gum by the native druggists. Among them are gum from the neem, the mango, the babool, (*A. arabica*), *Cassia auriculata*, cotton-tree, and several others. They are much inferior, however, to the gum of the *Acucia vera*.

A large quantity of excellent gum is procured in the East from the wood apple (*Feronia elephantum*), which much resembles gum arabic in its chemical and serviceable proportions, and from its ready solubility it gives the best mucilage for making black ink.

Dr. Wight tells us that good gums are obtained by the natives of Coimbatore from the following plants:—*Aegle marmelos*, *Prosopis spicigera* and *Acacia sundra*; and very

fair kinds from *Melia azadirachta*, *Acacia odoratissima* *Conocarpus latifolia*, *Soymeda febrifuga*, *Odina Wodier* and some others.

The bastard ebony tree of Central India, and also many other of the forest trees which abound there, yield large quantities of rich and valuable gums. Dr. Spry collected as many as fifteen varieties in one locality.

There are more than 130 species of the acacia in Australia, and from them exudes the purest gum-arabic. It is so plentiful that at particular periods several pounds may be collected in some places in an hour or two. It possesses all the good properties of the gum from Arabia, and is used successfully for the same purposes in the colony. The *Acacia Senegal* or *Mimosa Senegalensis*, a tree rising fifteen to twenty feet high, affords the SENEGAL GUM of commerce, which does not differ essentially from the gum of *Acacia vera*, except in the shape, and being somewhat less soluble. In 1849 we imported 5,696 cwt. of gum-senegal direct from Senegambia, and 256 cwts. from Morocco, whence the imports in 1853 reached to 2,838 cwt. In 1840, we imported 601 cwts. from the Gambia, and in 1851, 850 cwt. of gum-senegal, but none in subsequent years. In the Algerian collection at Paris, mention is made of Mesteba, an indigenous gum of Northern Africa, of which little seems to be known, except that it forms an article of traffic at the markets of the oases in the Algerian desert.

Another white gum, called Aourouar, is also spoken of, and which is said to be shipped to England by the way of Souira; a darker gum yielded by a tree called toleukh, is brought by the caravans from Timbuctoo. These are probably some of the darker and less valuable gum-arabics which come into commerce under the name of Barbary and other gums.

MEZQUITE GUM.—Attention has recently been called in the United States to the discovery, in great abundance, of a species of acacia, known as the mezquite tree, which furnishes large quantities of gum, nearly equal to the gum-arabic of Africa. It will no doubt prove a valuable source of revenue to the State of Texas, New Mexico, and the adjacent Indian territory, besides affording employment to the different tribes of Indians, now roving upon the plains, many of whom would be glad to gather and deliver it to the different frontier government posts for a very small compensation.

The mezquite is by far the most abundant tree of the plains, covering thousands of miles of the surface, and always flourishes most luxuriantly in elevated and dry regions. The gum exudes spontaneously in a semi-fluid state from the bark of the trunk and branches, and soon hardens by exposure to the atmosphere, forming more or less rounded and variously-coloured masses, weighing each, from a few grains to several ounces. These soon bleach, and whiten upon exposure to the light of the sun, finally becoming nearly colourless, semi-transparent, and often filled with minute fissures. Specimens collected from the trunks of the trees, were generally found to be less pure and more highly coloured than when obtained from the branches.

The gum may be collected during the months of July, August, and September; but the most favourable period for that purpose is in the latter part of August, when it may be obtained in the greatest abundance, and with but little trouble. The quantity yielded by each tree varies from an ounce to three pounds; but incisions in the bark not only greatly facilitates the exudation, but causes the tree to yield a much greater amount. As it is, a good hand will probably be able to collect from ten to twenty pounds in a day. Were incisions resorted to, double the amount might be obtained.

A simple, pure gum, was recently shown at Madras, obtained in Travancore, from the *Macaranga indica*, which has been used for taking impressions of leaves, coins, medallions, &c. When the gum is pure and carefully prepared, the transparent impressions are as sharp as those of sulphur, without its brittleness. The exudation appears to be an entirely unknown production.

Keekur gum, a variety of Arabic, is produced by *Vachillia farnesiana*. *Acacia Sirissa* in India yields a large quantity of a clear gum known as Dirisani gum, and closely resembling Keekur gum. Booraga, obtained from *Bombax malabricum*, is a pure gum.

TRAGACANTH is a gummy exudation, obtained from various species of *Astragulus*; *A. verus* (Olivier), *gummifera creticus* (Lamarck), which is imported for medicinal purposes from Smyrna and other ports in the Levant, to the extent of about five or six tons per annum. It is obtained principally from Northern Persia, Asia Minor, and America. Hamilton (Researches in Asia Minor, &c.) states that tragacanth, which is called by the Turks "kittereh," is collected in large quantities in the hills about Buldur, from a low prickly plant, resembling a species of furze. The white flaky gum is obtained by making an incision in the stem, near the root, and cutting through the pith, when the sap exudes in a day or two and hardens in the opening, after which it is collected by the peasants. Its price there was about 3s. 2d. per lb. 23 tons were imported in 1850 from Smyrna, and the imports have since annually increased, until in 1853 they reached nearly 70 tons.

A spurious tragacanth is obtained in the East from the *Sterculia urens* and *S. fœtida*, and an inferior tragacanth is also procured from *Cochlospermum gossypium*.

Leaving the true gums, we come now to the RESINS. These are either natural exudations or are obtained from some vegetable compounds by the aid of alcohol, in which they are generally soluble, although totally insoluble in water. They are for the most part brittle, tasteless or insipid, fusible at a moderate heat, soluble in the fixed and volatile oils, and some in the muriatic and acetic acids. They have no smell, except when they retain a portion of volatile oil, in which case they partake of the smell and acid taste of that oil. Resins generally burn with a strong yellow flame, emitting at the same time a vast quantity of smoke. Dammer affords a good example of the resins.

It is strange that of the origin of substances at once so valuable and so familiar to us so little should be known. The sources of the dammer and many of the wood oils from Singapore and the Eastern Archipelago are little known, nor are the copals, the anime, the myrrhs, and other valuable gums and resins from Africa, Zanzibar, &c., well defined.

COLOPHONY, the ordinary resin of commerce is the residuum remaining in the body of the still after common turpentine has been submitted to distillation for the manufacture of the oil of turpentine of commerce, or spirit of turpentine. The black resin, or colophony is the cooled brittle mass in the state in which it leaves the still; the amber, or yellow-coloured, is the same resin mixed with about one-eighth part of water while it is yet fluid.

Large quantities of resin oil, or pine oil, as it is generally called, are made in the metropolis and in the neighbourhood of Liverpool, Hull, Bristol, and Glasgow, and it is employed in the manufacture of grease for lubricating the bearings of heavy machinery, and the axles of railway waggons, &c. It is much used in France for the manufacture of printing-ink, and hence a principal source of the unpleasant odour of some of the French newspapers. About 23,000 tons of rosin are annually imported, of which the bulk comes from America, and a little from the Hanse towns.

One of the most important oleo-resins in a commercial point of view is Turpentine, of which we import from 17,000 to 25,000 tons per annum, almost exclusively from the United States. The comparative receipts in the last nine years have been as follows:—

	Tons.		Tons.
1846	17,897	1851	21,790
1847	16,193	1852	24,080
1848	20,089	1853	19,650
1849	20,666	1854	17,038
1850	21,731		

In the State of North Carolina, about 800,000 to 1,000,000 barrels of turpentine are now annually made, giving occupation to about 5,000 labourers in making it, and perhaps three times as many more human beings are supported mainly from the proceeds of its first sale. There are about 200 stills in operation there. The income of North Carolina from her pineries alone must reach half-a-million sterling.

The multifarious uses of the pine tree seem to augment with the development of the inventive talent and ingenuity of the age. Manufacturers already extensively use it in various processes. The painter draws deeply upon the turpentine to paint the four million of dwelling houses in Great Britain and the same number in the United States, besides the carriages and other vehicles. That great lever of public opinion, the press, could not put forth a printed page without it. Turpentine to the value of £50,000 or £60,000 is annually consumed in America by the Indian-rubber manufacturers. The new process of lighting up houses and whole cities with rosin-gas in America is consuming every barrel made, and has greatly raised its price there. The soap-maker, too, has long used it, and could not now dispense with it.

A liquid resinous exudation known as Chiam or Cyprus turpentine is obtained in Syria and the Greek Archipelago from *Pistacia Terebinthus*. The trunks of the largest trees are cut across with a hatchet, and the turpentine runs down on flat stones placed for the purpose, where it hardens. The quantity obtained from each tree is only about eight or ten ounces.

The coniferous trees of Europe and America furnish the turpentine, tar, and pitch of commerce, especially in Europe, *Pinus Sylvestris*, and *P. Pinaster*.

The swamp or long leaved pine supplies the chief portion of the turpentine, tar, &c., consumed in or exported from the United States. *P. Tæda*, abundant in Virginia, yields common turpentine, but of a less fluid quality than that which flows from the preceding species.

The resins are chiefly used in making varnishes and lacquers, for several purposes in dying, for sealing wax, and for ornamental house papering.

Varnishes may be divided into three classes, spirit varnishes, volatile oil varnishes, and fixed oil varnishes. The first class are easily prepared and applied, dry quickly and are free from unpleasant smell; they are used for articles of furniture and musical instruments.

The resins which enter into their composition are seedlac, benzoin, anime, or Thus. The varnishes made with essential or volatile oils are chiefly used for pictures—caoutchouc, and oil of turpentine, (turps, as as it is familarly termed), enter into their composition. Fixed oil or fat varnishes—dry easily—at common temperatures, and form a solid and nearly colourless glazing suited for coach panneling and house painting.

The fine copal varnishes do not dry so readily as if mixed in the proportion of three parts of anime and one of copal. Oil varnishes require to be kept a considerable time to ripen, as it is technically termed, before they are fit for use, the time varying from three to twelve months, according to the purpose for which they are intended, in order that the driers and other feculencies may be deposited and the varnish become bright and transparent.

Varnishes are very extensively employed in the arts and for domestic purposes. When we consider the large number of vehicles in use of various kinds, the superior classes of which, as private coaches, omnibuses and cabs, railway carriages, and the paint-work of ships' cabins, houses and household furniture, pictures, &c., all require varnish, we shall be able to form some slight idea of the consumption. The tenders for one railway company alone, the London and North Western, are for 1,500 gallons at a time. Gold and bronze lackering, and varnishes for stoves, &c., are other uses. The recent permission to use methylated spirit in the manufacture of varnish, free of duty, bringing down the price some 10s. to 12s. a gallon, will give even a further stimulus to the demand for resins, and probably lead to the more general employment of varnishes for woodwork instead of paint.

According to Thunberg, the very best Japan varnish is prepared from the *Rhus vernifera*, which grows in great abundance in many parts of that country, and is likewise cultivated in many places on account of the great advantages derived from it. This varnish, which oozes out of the tree on being wounded, is procured from stems that are three years old, and is received in some proper vessel. At first it is of a lightish color, and of the consistence of cream, but grows thicker and black on being exposed to the air. It is so transparent when laid pure and unmixed upon boxes or furniture, that every vein of the wood may be seen. For the most part a dark ground is spread underneath it, which causes it to reflect like a mirror, and for this purpose recourse is frequently had to the fine sludge, which is got in the trough under a grindstone, or to ground charcoal; occasionally a red substance is mixed with the varnish, and sometimes gold leaf, ground very fine. This varnish hardens very much, but will not endure any blows, cracking and flying almost like glass, though it can stand boiling water without any damage. With these the Japanese varnish the posts of their doors, and most articles of furniture, which are made of wood. It far exceeds the Chinese and Siamese varnish, and the best is collected about the town of Jasino. It is cleared from impurities by wringing it through very fine paper; then about a hundredth part of an oil called *toi*, which is expressed from the fruit of *Bignonia tomentosa*, is added to it, and being put into wooden vessels, either alone or mixed with native cinnabar, or some black substance, it is sold all over Japan. The expressed oil of the seeds serves for candles. The tree is said to be equally poisonous with the *rhus vernix*, or American poison-tree, commonly called swamp sumach.

The varnish tree of the Burmese (*Mel anorrhœa usitatissima*) is spread over a wide range of country, extending from Memipur, in lat. 25 N. long. 94 E., to Tavoy, lat. 14 N., long. 97 E. It attains its greatest size in the valley of Kubba, distant about 200 miles from the seashore. The trees average from 30 to 40 feet high, and have a circumference of from five to eleven feet, four feet above the ground. A good tree yields about 10 or 12 lbs. of varnish annually, and its value at Prome, on the Irawaddy, is about 10d. the pound; it is used in enormous quantities by the natives as a lacquer.

Dr. Wallich states that the natives never experience those deleterious effects from handling the varnish in its liquid state which Europeans generally suffer; in its fresh state, it has very little pungency of taste, and is altogether devoid of smell. The natives are very apt to adulterate that brought to market with sesamum oil.

WOOD OILS.—This class of resinous oils, known in all the Indian bazaars as gurgun oil, is obtained by tapping certain trees of the order Dipterocarpeæ (*D. laevis*, Hamilton; and *D. turbinatus*, of Roxburgh), and applying heat to the incision. The tree is a native of Chittagong, Pegu, Assam, the valley of Kubba, and the jungles of the Malayan peninsula, and grows to a great height. It is described as having a straight stem, of more than forty feet to the first branch. When not tapped too soon, the base of the trunk is often of immense girth, having a circumference of thirteen feet and upwards. About the end of the dry season, that is in March and April, several deep incisions are made with an axe into the heart of the wood, and a good sized piece scooped out; into these holes fire is placed, and kept burning until the oil begins to run, when it is received into a bamboo, and allowed to ooze slowly drop by drop. The average produce is about 40 gallons in each season. The oil which flows from the wound is a mixture of a balsam and volatile oil, and when applied as a varnish to wood or other substance, the oil evaporating deposits a hard and durable coat of resin.

These wood oils are chiefly used as natural varnishes either alone, or in combination with coloured pigments also as a substitute for tar in paying the seams of shipping, and for preserving timber from the attacks of white ants. They are said also to be useful as an ingredient in lithographic inks. This oil has all the medical properties of some of the more esteemed balsams.

From the comparatively imperfect knowledge we possess of the trees from which these valuable substances are derived, the oils generally receive the names of the localities from which they are imported—hence there are wood oils from Canara and the Madras Presidency, Malacca, Pegu, Moulmein and Rangoon, Singapore, Tinnevelly and China. The last-named deserves notice, as being one of the substances of which the well-known and much-prized Chinese lacquer is made. It is used in Singapore for painting the beams and woodwork of native houses, and may also be mixed with paint when not exposed to the sun.

DAMMER is the eastern name for a kind of indurated pitch or turpentine, exuding spontaneously from various trees indigenous to most of the Indian islands. The principal species are *Dammara Australis* (Don), the Kauri tree of New Zealand, and *D. Orientalis*, the pitch tree of Amboyna. The trees yield the dammer in amazing quantity, and generally without the necessity of making incisions. It exudes through the bark, and is either found adhering to the trunk or branches in large lumps, or in masses on the ground under the trees. As these often grow near the sea-side, or on the banks of rivers, the dammar is frequently floated away, and collected in distant places as drift. It is exported in large quantities to Bengal and China, and is used for all the purposes to which we apply pitch, but principally in paying the bottoms of ships. About 200,000 bundles of dammar are annually exported from Siam. Dammar fetches from 26s. to 32s. per cwt. in the London market. 100 to 300 cwt. of dammar and resin are annually exported from Ceylon.

The fruit of *Diospyros Embryopteris*, a native of the East, is so glutinous as to be used in Bengal for paying boats. A cheap and ready substitute for tar for preserving cordage, &c., might easily be found in some of the numerous resins and gum elastics of India.

COPAL is a valuable and singular kind of resin, that, according to some authorities, naturally exudes from different large trees found in the East Indies. Dr. Ruschenburger (Voyage Round the World) still asserts that it is a gum found about the roots, whence it is dug up in large quantities, and is often obtained from places where the tree had been grown many years before. The best copal is of a bright yellow colour, as transparent as amber, in small rounded lumps or flat pieces, hard and brittle, but easily reduced to powder. Its specific gravity is about 1·100. When dissolved in linseed oil, it forms a beautiful varnish, which, when applied to pictures, snuff-boxes, tea-trays, &c., gives lustre to the painting and brings out the colours. Copal is liable to be confounded with gum anime, which exudes from the roots of the locust tree (*Hymenæa Courbaril.*)

According to M. Landerer, of Athens, there are three varieties of copal, differing from each other in their properties, viz., Brazilian, West Indian, and East Indian, or Levantine, copal. The latter variety is sold in the bazaars of Jerusalem, Mecca, and other places as a species of choice incense, and it plays a very leading part in all the fumigating drugs of the East. The people employed in the collection of the copal in Palestine and Abyssinnia dig deep trenches round the trees, and then collect and sort the pieces of gum which fall into them. They are afterwards freed as much as possible of the earth that adheres to them by washing and stirring. African copal is obtained from a species of *Hymenæa*, and from fourteen to seventeen tons are imported to Liverpool from Sierra Leone. New Zealand copal is the Kauri gum; Brazilian copal is the produce of *Trachylobium Martianum*. The imports of gum copal, which, in 1846, were 759 tons, dropped, in 1849, to 200 tons. From the Phillippines we imported 354 cwt. of copal in 1851; 338 cwt. in 1852; and 497 cwt. in 1853; and from Singapore the exports have lately been increasing. In 1849 we received from that entrepot 53 cwt.; in 1850, 40 cwt.; in 1852, 218 cwt.; and in 1853, 521 cwt. The trade reports also record the import of 832 cwt. of copal from New Zealand in 1852, and from those islands 3217 cwt. of gum, not enumerated, were received here in 1853. In commerce, copal is distinguished into the hard and the soft kinds. The chief varieties of the former are—First, copal from Madagascar (in large flat yellow pieces), which, when cold, is tasteless and odourless, but, when heated, diffuses an aromatic odour: this kind is rather rare. Secondly, the East India copal, the most common commercial variety; it is rough on the surface, bearing the impression of sand. The best specimens are colourless, and in small pieces, constituting the copal from Calcutta. A third, but very small variety, is brought from the Brazils and south of Africa. We receive all the copal proper of commerce from India, whatever its primary source may be. In the Calcutta variety pieces of all the others are to be found; nor is a distinction readily to be made between the white copal of Calcutta and the yellow resin of Bombay; the difference appears to depend only on the care bestowed on the selection and purification of the pieces. The various resins, from anime to soft copal, Indian and Madagascar, seem to form a continued series, differing only in the increased quantity of oxygen they contain. A curious variety of copal is that in the pebble form, rounded by the action of water, of which there are specimens on the table.

Copal is the Mexican generic name for all resins. In the collection of products from Mexico shown at Paris there were several resinous gums, of which no particulars, however, were obtainable—one, an unnamed resin, very much like anime, another termed Axin resin, which burns with little flame and blackens, having evidently much gum with it—a whiter kind, called Archipan resin, has much the same properties, and a bitter flavour. A nominal copal from the same quarter resembles very closely the resin of Tacamahaca, being of a white colour, with a coniferous smell.

GUM ANIME of commerce is a resin of great value to the varnish maker, but it is now largely replaced by copal. Much of the anime received is believed to be the produce of the locust tree, *Hymenæa Courbaril*, and is, therefore, Western Anime, the Courbaril resin of Demerara. It is obtained there by digging in the vicinity of the roots of the tree, from which it exudes in a vertical direction in columns or pieces upwards of a foot in length. It may also be obtained by tapping the tree, when in the course of a few days a large solid mass is formed. It may be obtained in great abundance in various parts of British Guiana.

The best anime is, however, obtained from Zanzibar, and some other parts of Africa, whence it is imported in mats, and the fine and medium in cases. The imports are not large of gum anime. In some years it has reached thirty tons, in others it has not exceeded five or six. We now receive about 280 tons.

MASTIC is derived from the *Pistacia lentiscus*, a very common shrub in various parts of Northern Africa, where it is sought out for its resinous produce.

In the island of Chios, where the tree is cultivated for the sake of the resin as carefully as the vine, it is customary to make small incisions in the trunk and chief branches, about the end of July. From these clefts the sap, which gradually thickens, exudes; it hangs in larger or smaller drops, and when it is very abundant, trickles on the ground, and dries there. It is detached from the tree by means of a very sharp instrument; often it is caught upon cloths spread under the trees, in order to prevent any soil being derived by contact with the ground.

The largest consumption of mastic is in the East, where it is universally chewed, and thence derives its

name. It is asserted to be effectual in whitening the teeth, strengthening the gums, and sweetening the breath. Mastic is also used in the preparation of the finer varnishes for pictures, &c. Owing to a recent more extensive demand for France and deficient supplies, this gum has run up in price considerably, being now vended at about 1s. 6d. the ounce. As much as 1,500 cwt. was formerly annually exported from Chios. Dissolved in alcohol mastic forms a very useful cement. It is obtained in Brazil, from the *Pistacia Atlantica*, and in Beloochistan and Affghanistan from other varieties, *P. Kinjuh* and *P. Cabulica*.

Most of the Eucalyptus genus in Australia furnish gum in abundance, particularly the red, spotted, and white gum, the iron and stringy bark, and other trees. It exudes both spontaneously and in larger quantities, when incisions have been made in the trunk, more particularly after rain. It is seen in masses upon the trunk, but its particles have so little tenacity, that when in a concrete form any attempt to detach them in one entire lump fails, and it crumbles immediately into innumerable fragments.

This gum resin has a strong astringent quality, and is one of the varieties of the kino of commerce.

At first it is of the consistence of very thick syrup, and immediately after rain, may be seen flowing from an incision or cleft in the tree very abundantly, being then of a beautiful bright red colour, becoming of a dark shining red, and hardening by exposure to the air.

The *Angophora lanceolata*, or apple-tree of the colonists (a genus allied to that of Eucalyptus) also yields a dark and astringent gum from its trunk and branches. A gum as fine as amber exudes from the stem of a Macra Zamia in Australia.

The KOWRIE GUM of commerce is the produce of *Dammaris Australis*. For a long time it was much neglected, and the shipments made to this market did not repay the cost of its collection in the colony. The Americans however, purchased it readily at first for £16 to £20 the ton, and it was used by them as a substitute for copal in the manufacture of varnish. From 14 to 17 tons come in annually to Liverpool, and within the last year or two it has been in greater favour in the London market, and larger supplies are coming forward. In 1851, 16½ tons were shipped from the port of Auckland, and in 1852, 107½ tons. This resin may be obtained in any quantity in the northern districts of New Zealand, ranging from twenty miles south of Auckland to the North Cape.

The Kowrie pine grows to a gigantic size. The gum resin exudes from it, and bears some resemblance to the dripping of a wax candle in the wind. It is now in demand for the manufacture of varnish and other purposes, and it is found in masses of several pounds weight. The Kowrie gum, though clearly the produce of this tree, is dug from the ground in quarters where no traces of trees now exist. The gum-diggers probe the soil with long iron spikes, and extract the gum thus indicated from generally a couple of feet below the surface. These pieces of gum are probably the relics of primeval forests, which have disappeared long ago. The resin streams copiously from the stumps of the trees which have been felled, covering them with an appearance like wax, and hardening in the air.

BOTANY BAY GUM is a yellow resinous exudation from the *Xanthorrhœa hastilis*, and other species of the grass tree of Australia, which were generically named by Swartz, from this peculiarity. It is darker than gamboge, and less uniform in appearance, and not entirely soluble in alcohol. It has been used medicinally, to unite the edges of wounds, and in the form of tincture, with opium, in dysentery and diarrhœa, and also forms the base of a cement. This resin contains benzoic and cinnamic acids. Another species of the same family, *X. Australis*, furnishes a more brittle resin, of a brilliant dark-red colour, known in the colony as "black boy gum" These resins are spoken highly of as useful for varnish, and as substitutes for shellac. The grass tree is one great characteristic of the scenery and of the vegetation of Australia. It puts one in mind of a tall black native, with a spear in his hand, ornamented with a tuft of rushes. On the spear is found an excellent clear transparent gum, and from the lower part of the tree oozes a black gum, which makes a powerful cement, used by the natives for fastening stone heads on their hammers. This gum resin may be obtained in inexhaustible quantities.

Capt. Wray, R.E., submitted a report to the local authorities of Western Australia, last year, on the manufacture of illuminating gas from the Xanthorrhœa, at one-third the expense of lighting with oil or candles.

The plant grows in abundance all over the colony, and is composed of a core of hard fibry pith, about half of its whole diameter, round which there is a layer of resin, varying from half to one inch or more in thickness, which forms the connexion between the leaves and the core. Between these leaves, and also adhering to and covering them, is a considerable quantity of resin; resin also exudes in large lumps from the sides of the plant.

Method of obtaining the material.—In the first instance, the leaves and resin were separated from the core by breaking up the plant with an axe, and sifting the resin from the leaves, but it was found by experience that as much gas was obtained from an equal weight of the leaves and resin together, as from the resin alone. The quantity of resin obtained from an average sized "black boy" was about 45lbs. weight. This was collected easily at the rate of 5lbs. per hour by a person, having for his tools an axe and a sieve.

Should the resin be collected for export, I am satisfied that by a proper arrangement of crushers and sieves, a labourer, at 4s. per diem (the colonial rate), could collect at least one hundred weight per diem, enabling the resin to be brought to market, at Freemantle, for £4 per ton, the ton weight measuring forty five cubic feet when pressed. The quantity of pure gas obtained by Capt. Wray's experiments was at least four cubic feet to the pound of resin and leaves, but much more might be obtained by a more complete apparatus.

A cart load of the plants, 8 in number, weighed 1048 pounds. When the core was removed the leaves and resin weighed 628 pounds. This core is very good fuel when mixed with other wood. The specific gravity of the gas is 888. The products of the distillation are gas, tar, and coke. The tar obtained was about 1 quart for every 10 lbs., and this, when re-distilled, gave 8 per cent. fluid ozs. of naptha, and 20 per cent. of a sweet spirituous non-inflammable liquor. The coke remaining was about ¼ of the original weight, and with other fuel burns well. The coke of the leaf has a bright shining appearance, and when ground with oil is a very good substitute for lamp black in paint. The gas has a smell somewhat similar to coal gas, not nearly so offensive, but sufficiently strong to make any escape immediately perceptible. Its illuminating power appears to be very superior to coal gas, and its light very white.

Captain Wray is of opinion that when the production of the gas from the resin of the Xanthorrhea is conducted with suitable apparatus, the cost per annum will be materially reduced, so far indeed that the resin may become a large and profitable export from the colony to places which are either not lit at all, or lit with oil. Among these may be enumerated Singapore, Hong Kong, Melbourne and Adelaide.

The supply is, I may say, unlimited, and even were it not so, it would be advantageous to get rid of the plant from all the land fit for cultivation. Should, however, it be found that the plant was likely to get scarce, the resin might be obtained by tapping.

The gum resin of the New Zealand flax (*Phormium tenax*) is admirably adapted for sealing letters, and when remittances are enclosed, is frequently made use of by the colonists for that purpose. It is insoluble either in water or spirit, and so thoroughly penetrates the envelope as to

become part and parcel of it, nor is it possible to get at the contents of a letter so sealed.

One of the gum trees of Popayan in Colombia yields a resin so remarkably tenacious, that when used to varnish ornamental work, it resists the application of boiling water, or even acids, for which reason tables, cabinets, &c., made by the Indians, and lacquered with it, are highly valued at Quito.

At Copiapo a resinous gum is obtained from the branches and berries of a shrub, with a leaf like the rosemary. It is made into cakes of two feet long by one foot thick, and is used for paying of ships, glazing the earthen jars of the country, &c.—(*Frezier's Voyage.*)

Thenethea, the produce of an undescribed plant, is used by the Burmese as a coating for umbrellas and as a varnish.

The resins of Algiers are those from the teberinthe cedar, juniper, *pinus halepensis*, of which there are large forests, *thuya articulata*, and lentiscus, alk or lek, sandaric, mastic, and pitch and tar.

In 1853, France imported over 3 million kilogrammes of resinous substances, valued at 1,844,337 francs.

SANDARAC is obtained from the *Callitris quadrivalvis*, Rich., the *Thuya articulata*, Wahl. This tree furnished the highly-prized citrus wood of the ancient Romans; and the Thuya wood of Algeria has recently again come into high repute among the French cabinet-makers. Experiments for cultivating it on a large scale are now being carried out in the French African provinces.

It should be remarked that under the generic name of Thuya, various coniferous trees furnishing resin are confounded in Algeria. Sandarac is used in the preparation of varnish, and also for making pounce.

At the Paris Exhibition a light and transparent hard resin, from Coorg, was shown, of which I have a specimen on the table. It is said to be soluble in spirit, and suited for coach varnish, but Mr. Wallis does not speak well of it. The piney varnish of the *Vateria Indica*, is a kind of dammer, which is too soft for general purposes. An Assam resin, unnamed, is also a species of dammer, on which spirits of wine has little or no action.

The Gaub tree resin from Beerpoor is a very dark amber colour, which melts lighter in colour by heat and mixes with oil. There is also a more transparent lighter variety shown from Calcutta.

According to my correspondent, Mr. Ondaatje, a black resin is produced by a tree growing in the more barren parts of the district of Ceylon, in which he resides (Badulla), and belonging to the Anacardiaceæ, a tribe of plants which abounds in black resinous juice, whence the black varnishes used in China and India are obtained. It would seem to be the *Semecarpus obovatum*. From natural fissures of the bark, there runs out a clammy juice, which at first white, becomes afterwards black by exposure to the sun's rays, hardening into masses of different sizes with pieces adhering. The resin is hard, breaks with a smooth shining fracture, burns with a bright flame, melts in fire, and is soluble in turpentine, insoluble in water, and adheres strongly to wood and metal. It is free from acridity. It forms a superior black varnish when added to a saturated solution of vateria resin, or East Indian copal, in oil of turpentine.

Two specimens of Ceylon resin, which I have here from the Paris collection are merely species of dammer.

EAST INDIAN GUM KINO.—This, one of the most useful indigenous gum resins of the East, is the produce of the *Pterocarpus marsupium*, Roxburgh. The gum flows out on longitudinal incisions being made in the bark, which, being fleshy and very thick, is easily done. It trickles down in a tenacious semi-fluid form, and is collected in a cocoa nut shell. On exposure to the sun in flat plates, it soon hardens into angular brittle shining fragments, of a bright ruby colour, highly astringent, and readily soluble in hot water. The gum changes into a blood red colour by alkalies, which, however, destroy its astringent properties. It is precipitated by the salts of iron, silver, lead, &c., and, with sulphate of iron, forms a fine ink. It dissolves readily in water, to which it imparts its own beautiful colour.

Another variety of Indian kino exudes during hot weather from natural fissures and wounds in the bark of the *Butea frondosa*, a very common leguminous tree. It is known in commerce by the name of Bengal kino, or Gum butea, being closely allied to the kino of Pterocarpus, in its chemical and medicinal properties. The natives of India use it for tanning, but as it imparts to the leather a red colour, it is considered objectionable by European tanners. Kino is commonly used in medicine for its astringent properties, especially in diarrhœa, chronic dysentery, and other such cases.

AMBER.—The source of amber was long uncertain; by some it was considered a carbonaceous mineral, but it is now universally supposed to be a vegetable resin, the product probably of a Pinus. It is too well known in appearance to need description. It has several commercial uses. Being commonly translucent, and susceptible of a good polish, it is made into ornaments as necklaces. It is the base of an excellent varnish, and the source of succinic acid, which is employed in chemical investigations. The beautiful black varnish used by coach-makers, is a very carefully prepared compound of amber, asphaltum, linseed oil, and oil of turpentine. Amber often contains insects, flies, ants, spiders, &c., some of which are so delicately formed that they could not have occurred except in a fluid mass, such as a volatile oil or natural balsam. Mr. Wallis, of Long acre, has one of the largest and most interesting collections of these fossil insects I remember to have seen, and they occur not only in amber, but occasionally in the courbaril resin of South America, in copal and anime, and in copal from Accra. In its appearance and physical properties, amber strongly resembles copal, which is often fraudulently sold for it in the Indian bazaars.

We derive our chief supplies from Prussia, where it is thrown up on the coast between Konigsberg and Memel. The imports in the last few years have averaged about 40 cwt. yearly. Large deposits of amber were found a few years ago in some lakes on the eastern coast of Courland, not far from the Gulf of Riga; and in January, 1854, a bed of yellow amber, apparently of great extent, was found on sinking a well at Prague, from which pieces weighing two and three pounds were extracted. The largest block known is in the Royal Cabinet at Berlin, and weighs thirteen pounds.

This fossil is also found in Madagascar, in Japan, on the shores of the Indian Archipelago, and in small quantities on the coast of China. It forms a considerable item of import in the Chinese ports, the greater portion coming from the eastern coast of Africa; its value there formerly was very great as an incense and for ornaments. Transparent yellow pieces are considered the best, and the price in the East, as here, varies according to size and quality; for its colour ranges from black and yellow through red and white. A resin called false amber—no doubt a copal—is among the exports from Calcutta to Great Britain to the extent of several tons.

LAC.—This important resinous substance, which comes into our ports from the East Indies in various forms, to the extent now of 2,500 tons per annum, is obtained from the incrustations made by an insect (*coccus lacca*), similar to the cochineal insect on the branches and twigs of many trees in India, as *Vatica laccifera*, *Butea frondosa*, *Inga dulcis*, *Feronia elephantum*, *Erythrina indica*, *Schleichera trijuga*, &c. The lac is formed by the insect into cells, somewhat resembling a honeycomb, in which the insect is generally found entire, and owing to whose presence stick lac yields by proper treatment a red dye, nearly, if not quite, as bright as that obtained from cochineal, and more permanent.

Lac is found encircling the branches of these trees in the form of a tube (half an inch to one inch in diameter); the broken branches, with incrustations at various distances, is called in commerce stick lac, which ought to

be semi-transparent. The colouring matter, exhibited by grinding stick lac, and then treating it with water, constitutes seed lac. I have on the table specimens in the various forms, of the crude stick lac attached to branches of various trees, seed lac, lump lac, shellac, thin plates of a yellowish and brown colour, known as button lac, thread lac, and bleached or white lac of the shops.

The range of production of this resin is very extended, reaching from Bombay to the Eastern Archipelago, Ganjam, Nepaul, Burmah, the jungles of the Malay Peninsula, and those of Southern India. In the latter district it is not much collected for commercial purposes, although always procurable in the bazaars. The best lac is produced there upon the *Schleichera trijuga*, or cosumb tree, which abounds in the Central Provinces, and yields the colouring matter twice a-year. Bur lac is produced in the Rajpootana states, on the *Ficus indica* and *religiosa*, *Zizyphus jujuba*, and *Acacia concinna*.

The resin in stick lac constitutes about 68 per cent; in seed lac, 88 per cent; and in shellac, 91 per cent. The wax, which forms about 5 or 6 per cent., is analogous to myrtle wax

Our imports from India in the last twenty years have been:—

Years.	Shellac.	Seed-lac.	Stick-lac.	Lac-dye.
	Cwt.	Cwt.	Cwt.	Cwt.
1833	7,784		1,439	2,919
1841	29,056		2,340	10,905
1843	27,790		733	10,700
1844	14,873		1,194	7,636
1845	22,471		187	12,846
1846	9,449	418	293	5,541
1847	8,637	1,953	622	7,418
1848	14,362	34	358	4,449
1849	14,786	60	2,695	13,546
1850	20,245	1,524	9,189	17,930
1851	19,745	3,821	5,317	17,922
1852	16,356	934	3,054	17,139
1853	28,512	402		17,674

Exports from Calcutta. Twelve months, ending 31st August, respectively:—

	1855.	1854.	1853.
SHELL-LAC:—	Ind. Maunds.	Ind. Maunds.	Ind. Maunds.
To Great Britain.....	26,147	20,659	42,321
To France.....	8,609	5,951	11,324
To North America.....	124,630	21,103	11,290
	158,786	47,713	64,945
LAC-DYE:—			
To Great Britain.....	13,177	23,323	25,776
To France.....	1,152	510	3,141
To North America.....	5,884	799	7,745
	20,213	24,632	36,662

A resinous gum, called Alk or Lek (whence the word lac), flows from the *Pistacia Terebinthus*, Linn., in Algeria, which, mixed with other ingredients, is given as a purgative for fowls. It is supposed that this tree would yield good terebinthine. The gum flows so abundantly, even without incision, that it is often dangerous to sleep under the trees.

Under the commercial name of DRAGON'S BLOOD, the produce of several species of Dracæna, is imported, to the extent of about 100 packages of 1 to 2 cwt. each. In commerce the resin occurs in powder, grains, masses, drops of the size of an olive, and in sticks enveloped in the leaf of the talipot palm. Its chief use is for colouring artificial tortoise-shell, and in paints, varnishes, sealing-wax, &c. It stains marble, especially if the stone be heated. The resin is used occasionally in medicine as a tonic and astringent, and also in opiates and dentrifices. Occasionally a brick-red powder, known in the east as wurrus, has been passed off here for dragon's blood. This is collected from the seed-vessels of a euphorbiaceous tree, the *Rottlera tinctoria* of Roxburgh, occurring in Arabia, Eastern Africa, and various parts of India. The Chinese esteem dragon's blood highly. It is obtained in Socotra from the *Draccena draco*, which is usually met with on the hills at the elevation of 800 to 2000 feet above the level of the sea. There are two kinds there, and the best is of a dark crimson colour. Jacquin states that the lump dragon's blood is the produce of *Pterocarpus draco*, but this is very questionable. A common kind in the eastern bazaars is the produce of the red astringent fleshy fruit of the *Calamus draco*, or by incision in the stem, or natural exudations from various parts of the plant. An inferior kind is obtained by boiling the fruits. In the Madras bazaars dragon's blood ranges in price from £3 to £11 the maund of 82lbs. according to quality.

Dragon's blood was the cinnabar of the ancient Greeks. In the time of Dioscorides the opinion prevailed that it was the indurated blood of a dragon; and other old authors tell us that the tree received its name from having the figure of a dragon upon the fruit.

A red juice flows from the wild nutmeg on incisions being made into the bark. This hardens into laminated resinous pieces, red and transparent, and forms a variety of the substance known in commerce under the name of dragon's blood. Professor Lindley states, on the authority of Erdlicher, that a species of Myristica, of the Philippines, yields a crimson juice, which is collected from incisions in the trunk, and used as a substitute for dragon's blood, under the name of Durgan.

GUM GUIACUM of commerce. This solid and very friable resin, of which a few tons come in yearly, is the produce of the Lignum vitæ tree of the West Indies (*Guiacum officinale*). The colour of the resin is yellowish brown, but it becomes green on exposure to light. It is chiefly used medicinally in gout, chronic rheumatism, &c.

The wood being very hard and heavy, is extensively used for making pestles, rulers, and skittle-balls, and various other articles of turnery-ware. The resin exudes naturally from the stem of the tree, and may be seen in all seasons of the year. It is obtained most copiously by wounding the tree, which is usually done in May. Another method is by heat. The trunk and larger limbs being sawn into billets of about three feet long, an angular hole is bored lengthwise in each, and one end of the billet so placed on a fire that a calabash may receive the melted resin, which runs through the hole as the wood burns. It is also obtained in small quantities by boiling chips, or shavings of wood, in water, with common salt. The resin swims at the top, and may be skimmed off.

In the early part of the century we used to receive this resin from Portobello, whence 22 tons were shipped in 1801; now we get it chiefly from St. Domingo and Jamaica. We received from Hayti 54 cwt. in 1849, 447 cwt. in 1850, 78 cwt. in 1851, and 5 cwt. in 1852. It is not in large demand.

The Icica tribe, lofty trees of South America, produce resinous exudations of value in the districts where the trees occur. Of these I have specimens here in the Carana and Tacamahaca resins; and the resin of Perama, another dark resin from Central America. The *Icica Icicariba*, or *Amyris elemifera*, produces elemi, which resembles olibanum closely in its properties and uses.

In Demerara, Jamaica, and other quarters, a gum resin, similar to the gum anime of commerce, exudes from the lowest roots of the simiri or locust tree (*Hymenœa Courbaril*) in a vertical direction, in columns or pieces upwards of a foot in length. It may also be obtained by tapping the tree, when in the course of a few days a large solid mass is formed. It forms an excellent varnish, superior to Chinese lac, and is used for the same purposes as copal. It may be obtained in various parts of British Guiana in great abundance. Some was shown at the French Exhibition, of which I have a sample here. It is of a bright colour, with a brittle fracture, and is not unlike anime. A courbaril resin from French Guiana was also shown, which was of a bright lemon colour, but much coated. A

scraped copal from the same quarter, appears to be a good useful resin.

It is very satisfactory to find our colonies and foreign possessions drawing forth their latent energies in so highly creditable a manner. The admirable collection of raw products shown at Paris by the Island of Jamaica, and fitly rewarded with a gold medal, is an evidence of the talent, exertions, and activity displayed by the members of the kindred Society of Arts in that Island. Demerara, Madras, and New South Wales have also made excellent displays, and achieved much for the interests of commerce, science, and the arts.

FRAGRANT INCENSES.—A common use, and one of great antiquity, for many of the fragrant resins, is for odoriferous incenses in temples, &c.

In the East we have the gum Benjamin (the most costly), olibanum (the ancient frankincense), myrrhs, true and false as the googul, the muthipaul, the doopada resin, and poona rumpoly from a species of Boswellia. What is chiefly sold as common frankincense in our shops is gum Thus. In Trinidad, incense is obtained from the *Trichilia trinitensis*, but the list of fragrant and balsamic resins might be widely extended, and it will suffice to notice a few of the most important commercial resins of this class.

GUM BENJAMIN—or Benzoin, of commerce—is said to be the produce of the *Styrax Benzoin*, a lofty tree, which grows in Siam, Sumatra, and Java; but, according to some accounts, it would seem to be also obtained from a smaller tree, cultivated in Borneo. The best balsam is obtained in Siam by incisions made in the trunk of the tree, after it has attained the age of five or six years. The resin is white, and transparent at first. About three pounds are given by each tree for about six years. It forms an article of export from Siam. From Singapore, the exports in 1852 were to the extent of 1,282 piculs, and 168 piculs in 1853. Java imported last year Benjamin of the value of 176,182 florins. The different varieties bear a price proportioned to their goodness; the finest quality used to range from £10 to £20 per picul of 133lbs. Benzoin is the frankincense of the far east, and has long been used for incenses in the Roman Catholic, the Hindu, Mahomedan, and Budhistic temples, and probably in the Israelitish worship. Wealthy Chinese fumigate their houses with its grateful odour. Olibanum, which is cheaper, is in similar and more general use in other parts of the East Indies.

The GUM OLIBANUM of commerce is the frankincense of the ancients and the luban of the Arabs. In India it is obtained from several species of Boswellia, *serrata*, *thurifera*, and *glabra*. No botanical description appears to have been published of the African tree, although Capt. Kempthorne, Major Harris, and other travellers, furnish some general account of it. The tree invariably grows from the bare and smooth sides of the white marble rocks, or from isolated blocks of the same, scattered over the plain without any soil whatever. On making a deep incision into the trunk, the resin exudes profusely, of the colour and consistence of milk, but hardening into a mass by exposure to the air. The young trees produce the best and most valuable gum, the older merely yielding a clear glutinous fluid resembling copal, and exhaling a strong resinous odour.

Olibanum was formerly in high repute as a sovereign remedy against inflammation of the eyes, and as an efficacious remedy in consumption. It was also commonly drank as a stimulant in wine. But for all these purposes it has long gone out of use, and is chiefly imported here for reshipment to the Continent, being bought up by the Greek merchants.

The trees that produce the luban or frankincense are of two kinds, viz., the luban meyeti and the luban bedowi. Of these the meyeti, which grows out of the naked rock, is the more valuable, and when clean picked and of good quality, it is sold by the merchants on the coast for 1¼ dol. per frasila of 20 lbs. The luban bedowi of the best quality is sold for one dollar per frasila. Of both kinds the palest colour is preferred. The trees vary greatly in height, but are never above 20 feet, with a stem of nine inches in diameter. Their form is very graceful, and when springing from a mass of marble on the brink of a precipice, their appearance is especially picturesque.

Although the Wursungili range and other mountainous tracts afford an inexhaustible supply of frankincense, it is a mistake to suppose that elevated districts produce the best gum.

Lieut. Cruttenden, in his journey among the Edoor tribes, states that the gum of the large leaf kind of frankincense tree is not much prized. He noticed in his travels many other kinds of gum trees, for which he could find no name, and one of these he considered to be the gum elemi.

The quantity of gum of all kinds annually exported on an average from the Somali country, on the north-east point of Africa to India and the Red Sea, may be stated at 1,500 tons.

The wild gum trees in many districts are considered family property, like the date palms in other parts of Africa. Sometimes the young gum trees are transplanted, and thus cultivated they thrive well, and produce largely.

Major Harris describes the Myrrh tree (*Balsamodendron myrrha*) as growing abundantly on the Abyssinian coast of the Red Sea to the Straits of Bab-el-Mandab, over all the barren hill-sides of the low zone inhabited by the Danakil or Adaril tribes. It is called Kurbeta, and there exist two varieties; one (producing the better description of the gum) being a dwarf shrub with deeply serrated crisp leaves of a dull green, while the other, which yields a substance more like balm than myrrh, attains a height of ten feet, and has bright shining slightly dentated leaves. The myrrh, called Hofali, flows freely from any wound, in the form of a milky juice, possessing a perceptible acridity, which either evaporates or becomes chemically changed during the formation of the gum. The seasons for collecting it are in January, when the buds appear after the first rain, and in March when the seeds are ripe.

Every passer-by transfers such portions of it as he may find to the hollow boss of his shield, and exchanges it for a handful of tobacco with the next slave-dealer whom he meets on the caravan-route. The merchants also of the sea-coast, before returning from Abyssinia send into the forests that gird the western bank of the river Hawash, and bring away considerable quantities of the *Hofali*, which is sold at a high price.

The natives administer it to their horses in cases of fatigue and exhaustion. (*Trans. Linn. Soc*)

CEDAR GUM (*Widdringtonia juniperoides*, Endl.)—From the various branches and cones of the cedar tree of the Cape Colony exudes a gum which soon hardens in the air, becomes solid, yellowish, and transparent, and scarcely differs from the gum olibanum of commerce. This cedar gum is locally used for various medicinal purposes, for compounding plasters and preparing varnish.

BDELLIUM, or false myrrh, is believed to be the produce of *Commiphora Madagascarensis* of Lindley—the *Amyris commiphora* of Roxburgh. Googul is the common name for it in India. The gum resin is semi-pellucid and more yellow than myrrh, and a fragrant balsamic resin is also obtained from the tree.

The Doopada resin, or East Indian copal, exuding from the *Vateria Indica* in Mysore, Canara, and Malabar, &c., is used as a fragrant incense in the temples; the quantity procurable is very considerable. Muthipal, the resinous exudation of *Ailantus Malabaricus*, Decandolle, is said to be used as an incense in Cochin and Travancore. A very fragrant gum, the Hyawa, or incense, suitable for pastiles and similar purposes, is also obtained from the *Icica heptaphylla* of Aubl.

The shrub which produces the balsam of Mecca (*Balsamodendron opobalsamum*) is found, according to Major Harris, on the Arabian coast, at Cape Aden, where it is called Beshan, either the original of, or a derivative from, the

word balsam. It is the *Balessan* of Bruce, who did not meet with the true myrrh tree. The balsam flows copiously from incision, and the ethereal oil speedily evaporating, a tasteless gum remains.

BALSAMS.—When in their semi-fluid state, owing to the volatile oil they contain, resins are termed balsams, and the most important commercial balsams are Turpentine, (already noticed) Copaiba, Tolu, Peru, and Canada Balsams, Styrax, or Opobalsamum, and China varnish. The oleo resins are chiefly used as sources of the volatile oils and Gum resins in medicine. An aromatic oil, called oil of gum kikekunemale, is, according to some authors, obtained from a species of copal in the East.

Camphorwood-oil, obtained from *Dryobalanops camphora*, is used largely in Singapore as a substitute for turpentine, and sells at from 7d. to 10d. a bottle. I have several specimens here of the oils extracted from different resins with which Mr. Wallis has obliged me. A bituminous oil, obtained in the volcanic regions of the islands of the Eastern Archipelago, is shipped to Holland, and when distilled furnishes petroleum.

The balsam of capivi is obtained chiefly from *Copaifera guianensis* and *officianalis*, natives of South America and the West Indies. The imports from Brazil in the last five years have averaged 570 cwt.

Storax, copal and other gums, may be obtained in large quantities from the Indians in the interior regions of South America, and at prices merely nominal. The Balsam of Peru is imported to the extent of five or six tons per annum, being obtained from *Myroxylon peruiferum*. It is, however, obtained in Central America, and not in South America. Twenty-six cases of East India balsam were imported in September from Moulmein. The balsam exudes so abundantly at the proper season from incisions in the stem of the tree that 12 lbs. are frequently obtained in the space of three or four hours. The balsam of tolu is another oleo-resin imported to the extent of a few tons from South America. It is used in medicine, and as a flavouring ingredient by confectioners and perfumers. It is the produce of *Myrospermum toluiferum*. Liquid amber, or styrax, is another balsam of commerce of small consumption. Styrax Benzoin, or storax, in tears from Amboyna, from *Styrax officinale*, is a powerful and fragrant balsam, recently imported from the East. It formerly fetched a very high price.

CANADA BALSAM.—This well known fir balsam is procured from the American silver fir (*Abies balsamifera*). It is naturally deposited in vesicles on the trunk and limbs, and is collected by bursting these tumours and receiving their contents in a shell or cup. The fresh turpentine thus obtained is a greenish, transparent fluid, of an acrid, penetrating taste; it is highly celebrated here for medicinal and other purposes, and is generally designated in England "Canada Balsam." It makes a very fine transparent varnish for water-colour paintings, which does not become darker with time, and is much used in wax flower making.

Muscat is a great entrepôt for the collection of gums for re-distribution. About 15,000 to 16,000 maunds of asafœtida are imported there annually from Persia in Arab vessels, the greater part of which is re-exported to India.

Four thousand maunds of aloes from Socotra, and some of an inferior quality from Mocha and Macula are also received for reshipment to India, and 3,000 to 4,000 maunds of gum ammoniacum from Persia intended for Bombay. The maund is about 28 lbs.

Gum copal is imported from Zanzibar, and some, quantities of frankincense, gum galbanum, and gum from Persia and Bassora.

ASPHALTE is manufactured at home by one or two companies to the extent of two or three thousand tons per annum. Small imports are received from America and the Continent for the use of varnish-makers, but as it does not appear in the trade returns, it is probably included with pitch, of which we receive about 300 or 350 tons yearly. But little of the genuine Egyptian asphalte is now to be met with. There is one prolific source of asphaltum from which little commercial benefit has yet been derived, at least to the extent to which it is susceptible, and that is the Pitch Lake of Trinidad, covering a surface of about a mile in length by an eighth in width. Though the surface is generally too fine to receive a foot-print—just hard enough to cut readily with an axe—there are places where the pitch oozes out in nearly a liquid form. But the pitch is not confined to this locality. There are masses of it extending wider inland, and in several points it reaches to the sea-beach, whence it is shipped in large quantities to America, and some of the West India islands, to use in building and flagging streets. Near the Lake some of the negroes occupy themselves in boiling down the pitch, some of which is shipped in a pure state, and some, with the addition of lime, exported as mastic. Many hundreds of tons have been thus taken from the lake, to the depth of about a foot below the surface. The hole is always filled again within two days after the cutting, by the upheaving of the mass. It appears as though billions of tons of pitch had boiled up from the bowels of the earth, from the effects of an immense subterraneous fire, which had been extinguished, and left the asphaltum to cool in enormous bubbles.

Various attempts have been made to apply the inexhaustible store of bitumen afforded by this lake to some useful purpose. It is the best substitute for macadamization yet discovered. Mixed with sand and pebbles it is much used for pavements and the ground floors of houses at the town of Port-au-Spain, a purpose for which it is admirably adapted. The late Sir Ralph Woodford, when governor of the island, tried to obtain carburetted hydrogen gas from it to light a beacon on the tower of Trinity Church. It burnt well, but created such an intolerable stench, that the experiment was obliged to be abandoned. The person entrusted with the trial, however, knew nothing of chemistry. It has been employed to advantage as fuel by the American steamers plying on the Orinoco. It is thrown in the furnace among the wood, fusing too readily to be used alone.

With ten per cent. of resin oil it forms an excellent pitch for vessels. It was used for this purpose so far back as 1593 by Sir Walter Raleigh, who tells us that this substance was then in general use by the various tribes of Indians in the river Orinoco for caulking their canoes. It has been recently coming into use in the manufacture of petroleum. It might, I should suppose, form a base for some of the compressed artificial fuels.

The Earl of Dundonald has long had great faith in its ultimate commercial utility. Twenty or thirty years ago he shipped two cargoes of it to England, but it was found then to require too much oil in order to render it useful. Lately his lordship has purchased a large tract of the pitch lands, including twenty-six acres of the lake, and has instituted various experiments with the view of substituting the bitumen for India rubber and gutta percha in the manufacture of waterproof fabrics, covering of telegraph wires, &c. Judging from the specimens of these shown by his agent at Port-of-Spain (Mr. C. F. Stolmeyer), these efforts bid fair to be quite successful. It seems only necessary that the same amount of intelligent enterprise should be directed to the subject in order to render this wonderful reservoir of bitumen a source of great individual profit and of essential service to mankind. If it could be brought into extensive commercial use for pavements and for the ordinary purposes of pitch and tar, Trinidad could easily furnish supplies for the whole world. Persons desirous of information connected with this lake will find good accounts in the *United Service Journal* for January, 1839, by Dr. Thos. Anderson; in Martin's "West Indies," vol. i. p. 191; by Mr. Alex. Anderson, quoted in M'Callum's "Travels in Trinidad," originally given, I believe, in "Transactions of the Royal Society," vol. lxxix. p. 65, and in *Fisher's Colonial Magazine*, vol. iii. p. 43 and 426. The most recent and best account will be met with in a paper by Mr. N. S. Manross,

in *Silliman's American Journal of Science and Art*, vol. xx. p. 153 (No. for September, 1855.)

The ELASTIC GUMS are among the most important and generally useful that come into commerce, and although at present confined to two varieties, there is no reason why additions should not be made to the list, and investigation promoted to elicit the comparative value of others. The rapid progress of the submarine telegraph, setting aside other important commercial uses of gutta percha, loudly calls for fresh supplies. If no other purpose had been subserved by this Indian gum than that of encasing the telegraph wires, mankind would have reason to be eminently grateful to the discoverers, and to the Society of Arts for the reward and publicity given to its merits.

We can all recollect when the only uses to which India-rubber was applied was to rub out pencil marks and make trap-balls for boys, but now it is made into shoes and hats, caps and cloaks, footballs and purses, ribbons and cushions, boats, beds, tents, and bags; into pontoons for pushing armies across rivers, and into camels for lifting ships over shoals. It is also applied to a variety of other uses and purposes, the mere enumeration of which would be tedious. New applications of it are indeed continually being made.

Boundless forests of the Serang tree are found upon the banks of the Amazon, and the exportation of this elastic gum from the mouth of that river is daily becoming a business of more and more value, extent, and importance.

Already within the past five years we have doubled our imports from Brazil (besides the large quantities which the United States draw from thence), and we have also increased our supplies of this elastic gum from the East, the imports from Singapore having risen from 559 cwt. in 1849, to 3,030 cwt. in 1853.

Of substances which may be used as substitutes to some extent for caoutchouc or gutta percha, the inspissated juices of the jack fruits and trees, those from the wild and cultivated bread fruit trees, and the lola tree may be mentioned.

Various species of Indian fig-trees, as *Ficus Radula*, *elliptica*, &c., also furnish portions of the elastic gum of commerce. *Vahea gummifera* likewise supplies caoutchouc. The *Urceola elastica* (which produces the Gintawan of the Malays) abounds on the islands of the Indian Archipelago; in Java it is called "bendud."

The concrete milky juice of the *Cryptostigeia grandiflora* —a handsome climber, common in the Madras Peninsula— has long been known to contain caoutchouc, but it has not yet been collected for the purposes of commerce, and it is doubtful if a sufficient quantity could be obtained to render it an article of trade. The milk from the cow tree appears to contain caoutchouc. It is supposed to be obtained from *Tabernæmontana utilis* of Arnot, or a species of *Brosimum*. On the river Demarara the Indians climb the rubber tree, tap the trunk, and as the gum exudes, rub it on their bodies till it assumes a sufficient consistency to be formed into balls.

Recent inquiry has shown that caoutchouc is furnished of good quality, by a large number of milky-juiced plants belonging to different families (*Sapotaceæ*, *Apocynaceæ*, and *Euphorbiaceæ*). In the East, Assam now furnishes large quantities of India rubber from *Ficus elastica*. Complaints are, however, made of the want of care in the preparation of the article from Assam.

If the previous purifying of the gum be properly attended to—and in this process the whole art of manufacturing the perfectly elastic gum of commerce seems to exist—the gum should not, by any exposure to the atmosphere, be subject to the least degree of clamminess or viscidity; and if this important point be not fully attained, the article is of no use in the manufacture of those fine elastic threads which constitute its chief value in the European markets. The art of obtaining this complete freedom from clamminess, and consequent perfect elasticity, does not appear by any means to have been reduced to a certainty; and, consequently, a far better acquaintance with the article than is yet possessed by the Assam manufacturers seems requisite before it can be obtained with constantly the same results.

A substance resembling caoutchouc was said to have been obtained in Sierra Leone from a plant of the Euphorbia tribe, so long ago as Tuckey's voyage up the Congo, in 1816. Some large forest trees, belonging to the Sapotaceæ family, which abound at the foot of the Ghauts, N.E. of Trevandrum, furnish a valuable elastic gum, called by the Malays pauchouthee, which bears a strong resemblance to gutta percha both in external appearance and mechanical properties, and the real *Isonandra gutta*, would appear to be common in the forests of the Neilgherries.

GUTTA PERCHA has been discovered in the British province of Mergui, and though not precisely identical with the gutta percha of commerce, it possesses all the valuable properties of that substance, including plasticity in hot water, and the power of insulating electric currents.

The tree from which the true gutta taban is produced (erroneously misnamed in Europe gutta percha, a gum yielded by a different tree), is one of the most common in the jungles of Johore and the Malay Peninsula. It is not found in the alluvial districts, but in undulating or hilly ground. There is a great uniformity in the size of the full grown tabans, which rise with perfectly straight trunks from 60 to 80 feet in height, and from 2 to 3 feet in diameter, the branches being few and small. The natives, after felling the tree, make an incision round it, from which the milk flows. This is repeated at distances of 6 to 18 inches along the whole trunk. It appears that the taban, or milky juice, will not flow freely like dammer and caoutchouc, but rapidly concretes. Its appearance in this state before being boiled is very different from that of the article as imported into Singapore, and thence shipped to Europe. It has a dry ragged look, resembling shreds of bark, and instead of being dense and tough, is light, and possesses so little cohesion that it is easily torn in pieces.

Various statements are made as to the produce of each tree, which is somewhat surprising, considering the uniform size of the trees. The extremes mentioned are two catties and fifty catties. Dr. Oxley takes the average yield at ten catties, but probably five would be nearer the mark, hence it would take twenty trees to produce one picul of gutta, or 133lbs., and as the exports of gutta percha, from the commencement of the trade up to the close of 1853, have amounted to 3,107 tons, it follows that upwards of one million trees must have been destroyed to obtain that quantity in nine years. The natives, however, do not appear to be under any apprehension that the trees will be extirpated, and smile at the probability when suggested, for it is only trees arrived at their full growth, or at least at a very considerable age, that repay the labour of felling them and extracting the gutta, and those of all inferior ages which are therefore left untouched, will, it is supposed, keep up the race.

The collection of the gutta has widely extended, embracing now the Johore Archipelago, Sumatra, Borneo, and Java. Unfortunately the quality has deteriorated by the admixture of gutta percha, jelotong, gegrek, litchin, and other inferior gums, the products of different trees, which are often used to adulterate the taban.

The Gitah Lahoe is the produce of *Ficus cerifera*, Blume, which promises to be of great importance in an industrial point of view. The natives of Sumatra form torches of it, which burn with a clear flame, but make a great deal of smoke. A hydro-carbon, closely resembling Cullemundoo gum, from Jaulhna, was shown this year at Madras, obtained from *Euphorbia tirucalli*. It differs considerably from caoutchouc or gutta percha in its physical qualities.

The milky juice of the Muddar plant of India (the *Asclepias* or *Calotropus gigantea*), gradually dries and becomes tough and hard, like gutta percha. It thrives

on the poorest soils, and also furnishes an excellent fibre, useful in the place of hemp and flax.

The juice of the sappodilla plum tree, the *Achras sapota* of the West Indies and South America is slightly adhesive to the touch, but it differs from gutta percha by becoming adhesive and extremely glutinous after being immersed in boiling water, while gutta percha immediately on exposure to a cooler temperature regains its original toughness and flexibility.

An elastic gum resin from an Australian Ficus was shown at Paris in the New South Wales collection, in small tears, of a dingy appearance, which might prove useful. A large portion dissolves in warm linseed oil, but spirits of wine does not act readily on it. By mastication it becomes tenacious and bleaches thoroughly.

The Royal Patriotic Society of Havana endeavoured to introduce the cultivation of the *Ficus elastica*, and other elastic gum-yielding plants into the island of Cuba, but their efforts seem not to have succeeded.

The Cullemundoo gum attracted particular attention in 1851, and the exhibitor was rewarded with a prize medal, from the impression of its adaptability to various purposes in the arts. It is obtained from the *Euphorbia antiquorum* of Roxburgh, and this year, at the local exhibition at Madras, the products of two other species, *E. Tirucalli* and *neurifolia*, received honourable notice, although the substances differed in their physical qualities from the true elastic gums of commerce.

An examination of the inspissated gum elastic juices of a number of trees from different localities, and prepared in a different manner, renders it probable that there are a variety of similar vegetable products yet untried, which may be advantageously introduced into commerce. They certainly deserve to be brought specially under the notice of our manufacturers, though as yet many of them are almost unknown to the very natives of the places where they are prepared. Gutta trap, the inspissated sap of an Artocarpus, obtained on the island of Singapore, and used for making birdlime, was favourably mentioned by the Jurors in 1851.

A few words on the medicinal gums of commerce will serve to bring this lengthy paper to a close.

GUM AMMONIACUM.—An opaque, cream-coloured gum, closely resembling in taste, smell, and general appearance, the ammoniacum of the shops, was gathered by the late Dr. Stocks. in Beloochistan, from the *Dorema aureur*, a tall, umbeliferous plant, described by him in Hooker's *Journal of Botany*, vol. 4, p. 149. He also found there the following fœtid gums, differing from the ordinary ones of English commerce. Gum resin of *Ferula orientalis*, Linn., in semi-transparent, yellowish brown tears, having a galbanum-like smell, and a strong, bitter, peculiar taste. From another species of Ferula he gathered a pale, yellow, waxy-looking, gum-resin, with a somewhat alliaceous and cubeb like taste. The average imports of ammoniacum in the last few years have been about 400 cwt. Medicinally it is considered the least powerful of the fœtid gum resins.

Euphorbia officinarum, canariensis, and some other fleshy species, produce the saline, waxy resin, called in the druggist's shops, GUM EUPHORBIUM, which is the inspissated milky juice of the plant.

ASAFŒTIDA (*Narthex asafœtida*), according to the information of Dr. Falconer, who gathered it in among the Dardohs, a wild race of Central Asia, furnishes the Heeng, or asafœtida of commerce.

The plant is found in the greatest abundance in the Persian provinces of Khorassan and Laar, and thence extends on the one hand into the plains of Toorkistan, upon the Oxus, where it seems to have been met with by Sir Alexander Burnes, and on the other, stretches across from Beloochistan, through Candahar and other provinces of Affghanistan, to the eastern side of the valley of the Indus in Astore. Dr. Falconer did not meet with it in Cashmere. Captain Burslem, in his Journey in Toorkistan, states that the asafœtida shrub abounded on the hills, and they were almost overpowered by the horrible stench exhaled therefrom. It is collected in its wild state and sent to Cabul and India, yielding a good profit to those who pick it, as it is used very generally throughout the East for kabobs and curries.

Although these fœtid gums are now branded with all sorts of vile names for their offensive odour, yet they were in high repute among the ancients, asafœtida being reckoned one of the most agreeable seasonings for food, and highly esteemed for its medicinal uses, so that it was worth its weight in silver. A stalk of the plant was sent to the Emperor Nero, and yearly to Apollo of Delphos, as more precious than the other productions of the earth, insomuch, that "he is worthy of silphium," passed into a proverb, (silphium being one of the names by which it was formerly known.) Even in the present day, the Persians, and other Asiatics flavour their food with asafœtida, and term it the food of the gods. Tastes we know differ, for by some garlic is highly esteemed, while others detest its flavour. Asafœtida ranks high in the Materia Medica of the Chinese physicians. It forms an important article of trade in the East. The vessels that carry it to the Chinese ports from Bombay, are so imbued with the odour, that they spoil most other goods. Our annual imports of asafœtida range from 50 to 100 tons, but the greater portion is re-exported.

The gum resin called SARCOCOL is seldom now seen in the shops. It has the transiucency and much the appearance of gum arabic. In Persia it exudes from all the parts of the *Penœa mucronata*, and in the Cape Colony it is said to be produced on the perianth of *P. Sarcocolla*, and other species of the shrub.

GAMBOGE.—This gum resin is imported to the extent of from 500 to 1000 cwt. annually, and is used in water-colour painting, and in medicine as a well-known cathartic. Our principal supplies are received from Singapore. Gamboge of good quality was worth there early in the year, 26 dollars the picul, equal to about £4 4s. the cwt. It may be obtained also from Ceylon, where it is produced by the *Hebradendron cambogoides*. The plants furnishing gamboge in other districts are not yet well defined.

Gamboge is obtained in Coorg, Mysore, Canara, Malacca, and Labuan. That from Malacca is the finest pipe variety, all the others are in the form of lumps or tears. The commercial character of this product may be altered by trivial circumstances, the exudation being yellow, reddish, or brown, and of different degrees of solidity, according to the season of the year and the method of manipulation.

The gamboge of the Madras peninsula has been found to be a useful pigment and an effective purgative. It has been lately added to the list of country medicines, and it appears that the tree is so abundant along the coast of the Ghauts, that the product may be obtained in very considerable quantities in the forests of Mysore, Malabar, and Canara. It has been collected there with much care in homogeneous masses, without air vessels, free of woody fibres or other impurities, and is produced by *Garcinia pictoria*, while that from Labuan is probably from *G. Cochin-Chinensis*.

OPIUM.—This well-known gum, the produce of the capsule of the poppy, enters largely into commerce in the East for stimulating and exciting purposes, and in Europe for medicine. The production in Bengal, chiefly for the supply of China, amounts to between five and six million a year! Our imports average from 150,000 to 200,000 lbs., and the home consumption has exceeded 60,000lbs. per annum, on the average of the last four years.

GUM SCAMMONY is the milky juice, or gummy resinous exudation of a plant of the Convolvulus tribe, which is used entirely in medicine, and it is exceedingly difficult to get it genuine. The consumption is not large; the imports in 1853 were 9704 lbs., nearly all from the Turkish dominions.

There are one or two important articles of commerce, which, though not strictly gums or resins, but more pro-

perly inspissated extracts, deserve a passing notice, these are the Kinos imported for manufacturing and medicinal use. The Society of Arts early stimulated inquiry and investigation into these products, for the use of the tanner, dyer, &c., and in 1804 the gold medal was awarded to Dr. Howison, for certain useful extracts, and in 1824 Messrs. Pitchey and Wood, of Van Diemen's Land, also received the Society's Ceres Medal for other extracts. Sir Joseph Banks had some time previously drawn attention to the value of Terra japonica, or GAMBIER. This is an extract prepared from the leaves and branches of the *Uncaria Gambier*, of Roxburgh, cultivated chiefly at Singapore, by the Chinese, and of which our imports average upwards of 91,000 cwt. per annum.

The CUTCH of commerce, kuth, or catechu of India, is manufactured in the East from the heart and leaves of the wood of *Acacia Catechu*. Our imports of this substance for tanning, &c., amount to about 35,000 cwt. annually. The sources of supply are Burmah, Bombay, the Concan, and other parts of India. Of this astringent there are now large exports from the Madras territories. Last year (1854) they amounted to 1,369 cwts.

There are many samples from Madras, which may be reduced to three varieties:—

1. Circular flat cakes from Travancore, covered on both sides with paddy (rice) husks.
2. Large flat cakes, from the northern division, varying in colour from brickdust to dark yellow.
3. Round balls of a dark brown colour, the size of a small orange from Mangalore, where a large manufacture takes place. The exports of Cutch from Calcutta in the last two years have been as follows:—

	1855.	1854.
To Great Britain	26,624	27,084
France	8,712	2,812
North America	2,201	10,007
Indian Maunds...	37,537	39,903

Gambier from Rangoon comes in cubical cakes, covered with a malvaceous leaf.

The genuine GUM KINO of commerce is, as I have already stated, the natural exudation of *Pterocarpus marsupium*, and forms an article of export to the extent of a few tons from the Malabar coast. Gum Butea, from *Butea frondosa*, furnishes the Bengal kino nearly equal to the preceding.

The specimens I have seen are quite identical with the ordinary kino of commerce. Australian kino is obtained from the iron bark tree, a species of Eucalyptus. Jamaica kino from the *Cocoloba uvifera*.

Annual Imports and Estimated Value of the Gums, Resins, Balsams, &c., of British Commerce, including Gum substitutes and Vegetable Extracts:—

		£
Balsams, about	1,000 casks or packages ...	14,000
Liquorice Paste...	2,089 cwts.	
„ Juice..	9,775 „	
Turpentine	17,038 tons	170,380
Tar.....	24,500 „ at £6	147,000
Pitch & Petroleum	6,353 cwts. at 50s. per ton	800
Rosin	23,000 tons	115,000
British Gum	3,000 tons at £42	110,040
Lac Dye.....	18,050 cwts. at £11 ...	198,550
Seed Lac	402 „ 25s. ...	503
Shellac	28,512 „ 50s. ...	71,280
Stick Lac	2,000 „ 30s. ...	4,500
Caoutchouc	27,588 „ £7 ...	193,116
Gutta Percha.....	21,792 „ £5 10s. ...	119,856
Terra Japonica, or Gambier.....	4,550 tons at £25 ...	113,750
Cutch.....	1,700 „ £30 ...	51,000
Aloes	110 „ £60 ...	6,600
Amber	37 cwts.	
Ammoniac.....	28 cwts. at £2	56
Anime and Copal	6,000 „ 16s. ...	96,000
Arabic	61,614 „ 50s. ...	153,535
Asafœtida	400 „ 30s. ...	600
Benjamin	900 „ £12 ...	10,800
Dammer	1,300 „ 50s. ...	3,250
Dragon's Blood...	190 „ £6 ...	1,140
Galbanum	24 „ £11 ...	264
Gamboge	341 „ £5 ...	1,705
Guiacum	20 „ £7 ...	140
Kino	250 „ £2 ...	500
Mastic.....	430 „ £22 10s. ...	10,125
Myrrh	230 „ £3 ...	690
Opium	159,312 lbs. at 10s. ...	79,656
Olibanum	10,000 cwts. at £2 ...	20,000
Sandarac	230 „ 70s. ...	805
Scammony.....	9,704 lbs. at £2 ...	19,408
Senegal	9,000 cwts. at 45s. ...	20,250
Tragacanth	70 tons at £5 ...	350
Unenumerated Gums.....	6,000 cwts. at £2 ...	12,000

The aggregate market value of these articles, therefore, at the current prices of the day, approximates to two millions sterling.

The following works and papers may be consulted by those desirous of further investigating the subject of gums and resins, &c.:—

For the medicinal gums, resins, and vegetable juices—

Lindley's Flora Medica. Longmans.
Brande's Dictionary of Materia Medica. Parker.
Brande's Manual of Chemistry. Parker.
Ure's Dictionary of Chemistry. Tegg.
Thomson's London Dispensatory, by Dr. Garod. Longman.
Dr. Royle's Manual of Materia Medica. Churchill.
Gray's Supplement to the Pharmacopœia, by Redwood Renshaw.
Dr. Pereira's Materia Medica. Part II. Longman.
A Treatise on Foreign Vegetables, chiefly taken from Gregory's Materia Medica, by Ralph Thicknesse, M.D. London, 1749.
Dr. O'Shaughnessy's Bengal Dispensatory. Calcutta.
Thomson's Organic Chemistry—Vegetables. London: Baillière.
Pornet's Histoire des Drogues. Paris.
Paper on Production of Opium in Asia Minor, by Mr. Maltass. Pharmaceutical Journal, Vol. XIV., p. 395.
Dr. Little on the Preparation of Opium. Journal of the Indian Archipelago, Vol II., p. 1. Singapore.
Milburn's Oriental Commerce [contains good accounts of the Eastern Gums, &c., but they are old]. Allen and Co.
Lindley's Vegetable Kingdom. London: Bradbury.
Archer's Economic Popular Botany—Chapter on Gums. London: Reeve and Co.
Poole's Statistics of Commerce. London: W. H. Smith.
Knight's Industry of all Nations [contains a good account of the Gums under their alphabetical names].
Lowig's Principles of Organic Chemistry; for the Composition of the Resins. 1853. Spon, Bucklersbury.
Jury Reports of the Great Exhibition; East Indian Catalogue; Jamaica Catalogue, and Madras Catalogue of Articles shown at the London and Paris Exhibitions.
The Annual Parliamentary Papers on Trade and Navigation for the Statistics of Import and Consumption, also a Monthly List, published by Smith, Hart-street, Mark-lane, for the Imports, Stocks, and Consumption of many of the minor articles not particularised in the Parliamentary trade returns.
Some Recent and Trustworthy Information on the Gums and Gum Resins of Africa and Arabia will be found in a series of Articles by Mr. James Vaughan, of Aden, in the Pharmaceutical Journal, vol. XII., p. 226, et seq.
On Gutta Percha, Caoutchouc, &c., by Dr. Adriani. Ibid, vol. X. p. 546.

Caoutchouc and Gutta Percha; abstract of a Lecture by Professor Calvert. Pharmaceutical Journal, vol. XII., p. 453.

——— on extraction of, by M. Weddell. Ibid, vol. XV., p. 116.

The Indian Rubber of the Amazon, by R. Spruce. Ibid, 117.

On the Plant yielding Gutta Percha, by Sir W. J. Hooker. Pharmaceutical Journal, vol. VII., p. 179.

On various applications of Gutta Percha, by Mr. Weston. Pharmaceutical Journal, vol. VIII., p. 141.

——— by Mr. E. Solly. Ibid, vol. V., p. 510.

Several extracted articles on Gutta Percha. Ibid, vol. VI., p. 376.

Article on Gutta Percha, by Dr. Oxley. Journal of Indian Archipelago, vol. I., p. 22.

Paper by J. A. Logan on the Range of the Gutta Taban Collectors. Ibid, vol. II., p. 529.

Camphor Tree of Sumatra, by Dr. Vriese, Pharmaceutical Journal, vol. XII., p. 22, and by Sir W. J. Hooker, ibid, p. 300.

On the Chemical Examination of Kino, by Henning. Pharmaceutical Journal, vol. XIII., p. 77.

On Kino from Moulmein, by Dr. Christison. Pharmaceutical Journal, vol. XII., p. 377.

On Kino, by A. Gibson. Ibid, p. 497.

The Kino of Western Africa, by Dr. Daniell. Ibid, vol. XIV., p. 55.

On East Indian Kino, by Dr. Royle. Ibid, vol. V., p. 495; and by Rev. F. Mason, ibid, vol. VIII., p. 387.

On Resin and Resin Oil Manufacture. Pharmaceutical Journal, vol. XII., p. 345-389.

On the Scammony of Smyrna, by Mr. Maltass. Pharmaceutical Journal vol. III., p. 264, and by Mr. Hanbury, p. 268.

On the Test of its Purity. Ibid, vol. XIV., p. 38.

On Tragacanth and its Adulterations [a valuable paper], by Mr. Maltass. Ibid, vol. XV., p. 18.

On Gum Mezquite. Chemical Gazette, by Dr. Morfit, No. 297, 1855; reprinted in Pharmaceutical Journal, vol. XV., p. 42.

On the Constitution of the Resins, by Johnson. Philosophical Transactions.

On the Frankincense Tree of Western Africa, by Dr. Daniell. Pharmaceutical Journal, vol. XIV., p. 400.

——— of Sierra Leone, by Mr. Bennett. Ibid, p. 251.

On the Hog Gum Tree, by Dr. Hamilton. Ibid, vol. VII., p. 270.

On Gum Ammoniacum, and Indian Copal. Ibid, vol. II., p. 773.

Chemical Analysis of Myrrh. Quoted in Pharmaceutical Journal, vol. V., p. 376.

On the Tree yielding African Olibanum, by Dr. Royle. Ibid, vol. V., p. 541.

On the Resins of Xanthorrhœa Hastilis, by Dr. Stenhouse. Ibid, vol. VI., p. 88.

On the Gamboge of the Tenasserim Provinces, by the Rev. F. Mason. Ibid, vol. VII., p. 398.

On the Gamboge Tree of Siam, by Dr. Christison. Ibid, vol. X., p. 235.

On the Manufacture of artificial Gums or Dextrine. Newton's London Journal, No. 179; and reprinted in the Pharmaceutical Journal, vol. VII., p. 138.

On Australian and Turkey Gums, by Dr. Hopff. Pharmaceutical Journal, vol. VII., p. 588.

Liquid Amber Tree of the Tenasserim Provinces. Ibid, vol. VIII., p. 243.

On the Purification of Gum Arabic, by H. Piccioto. Ibid. vol. IX., p. 16.

On the Resin of the Norway Spruce Fir, by Mr. D. Hanbury, jun. Ibid. vol. IX. p. 400.

On the Balsam of Pine and White Balsam, by Dr. Pereira. Ibid, vol. X., p. 290, 280.

DISCUSSION.

The CHAIRMAN said that they had all heard the elaborate and interesting statements on this important matter. He was sure that there were many persons present able to make valuable remarks on the subject, and equally sure the members of the Society would be glad to hear them.

Mr. CONYBEARE said there was one point in the admirable paper of Mr. Simmonds worthy of great attention, viz., the attempts to economise manufactures in which gum was used, by the employment of gum substitutes. He thought they ought to discourage as much as possible the use of articles of human food in the preparation of manufactures to make them sell better, it being well known that the dextrine only gave an appearance to cotton which washed out. Mr. Simmonds had alluded to the large quantity of flour used in cotton manufactures as a substitute for gum. As an example of this he might state that a short time since he went over one of the largest cotton manufactories in the kingdom, the extent of which they might imagine when he told them that it employed 1,500 hands, and the proprietor, a most intelligent man, told him that the cotton manufactured there eat up as much flour as would feed the whole of the hands in the establishment. He thought that this Society ought to express an opinion that such a waste of human food should be discouraged. This dextrine, so far from adding value to the cotton, absolutely deteriorated it; and the wife of the manufacturer to whom he had alluded knew this so well that she would not have it used in any cotton intended for her own consumption. As had been well stated the other day by Prince Albert, at Birmingham, the most pleasing part of science was that which rendered the greatest benefit in improving and economising the cost of manufacture.

Mr. HYDE CLARK felt they must all be obliged to Mr. Simmonds for his valuable paper, and no gentleman better understood the subject, he being the author of a standard work on The Commercial Products of the Vegetable Kingdom. The industry and research of Mr. Simmonds proved the value and importance of a commercial museum, for which the Society of Arts had laboured; and they were much indebted to Professor Solly and Mr. Simmonds for their exertions in this direction. There could be no place like a Trade Museum for watching the change of fashion, and showing what article chemical science might enable them to substitute for another, should there be a great rise in price or a dearth of produce in any particular article. He hoped the valuable collection laid before them that evening would stimulate them in their exertions to support the Trade Museum to be established at the West-end by the Exhibition Commissioners, and also that which Mr. Simmonds was endeavouring to found in the City. However important and valuable a museum might be at the West-end, merchants could not run away from their business in the middle of the day to examine it if they wished to know any particular thing. Of course persons who dealt in an article knew its value, but there were many articles, of which the public knew nothing, the dealings in which were confined to two or three houses, and in which large speculations took place to the injury of the public, who did not know what would be its proper substitute.

Mr. HILTON believed that the rise in the value of resins, alluded to by Mr. Simmonds, was principally owing not to any difficulty in procuring them, but to the rise in the freight. These resins came over in barrels, weighing say, two cwt., and a rise of 2s. 6d. to 5s. per cwt. in freight, raised their commercial value from 5 to 7, and even 800 per cent. He did not know what was the value of dextrine, but he knew that gum arabic had been lately as low as 21s. the cwt. He was not aware whether gum arabic could be used in place of dextrine, but if so, it would depend upon the value of the latter article.

Mr. SIMMONDS said the best was about 40s. the cwt.

Mr. HILTON thought they might rely upon it that any supply of gum arabic might be obtained from 23s. to

36s. per cwt., and if so, they could hardly say dextrine was used as a gum substitute.

Mr. REA had often paid 56s. per cwt. for it.

Mr. SPARKES HALL having said a few words on the value of indiarubber and gutta-percha for the manufacture of shoes and goloshes,

Mr. PEARSALL said, without going into statistics, one great advantage arising from the use of starch substances in manufactures, had been to find a ready and very profitable market for all kinds of damaged flour and grain, and it was now almost impossible to find any damaged grain in the food market. For the damaged grain a price nearly equal to that paid for the superior kind was realized.

The CHAIRMAN said the paper just read by Mr. Simmonds had afforded them ample materials for the evening's consideration. The question of gums and resins was one of universal application. Resin was an ingredient in the fabric of nearly all plants; gum was another, and there was no perfect plant in which both resin and gum were not present, the difference being, that some plants had gum in excess, others resin, while others had both in excess, the superfluous quantity being thrown off in the shape of excretions. The chief source of the production of gums and resins would be hot countries, such climates being peculiarly favourable for their production. The long list of gums and resins brought before the notice of the meeting by Mr. Simmonds might be greatly extended; in fact, the supply might be said to be inexhaustible. With regard to the objection raised to converting articles of food into dextrine, or gum substitute, it must be remembered that this took place at the expense of the starchy matter of plants. It occasionally happened that some plants were extremely poisonous, and their starch could not be used for the purpose of food, but it might be separated for conversion into gum. What had been mentioned by Mr. Pearsall, viz., that damaged flour was just as good as the finest grain that could be procured for manufacturing purposes, was explained by the fact just adverted to. So long as grain was damaged by circumstances which merely affected its condition as an article of food, the starch remained unaltered, and, therefore, it was clear that samples which have no commercial value as food, were perfectly well adapted for the making of dextrine. In the case of the potato blight a short time back, although the potato became decayed and altogether unfit for human consumption, nevertheless, all the starch grains remained, if not altogether unchanged, at least very little altered. Therefore, the most inferior kind of potatoes, such as are given to pigs, were as capable of yielding starch for the purposes of dextrine, as those of a finer and better description. It was possible that this part of the subject might not be generally understood, and it, therefore, seemed worthy the notice of the meeting—to do away with an impression that none but the best articles were applicable for making dextrine. In conclusion, he begged to move a vote of thanks to Mr. Simmonds for the elaborate and useful paper he had read upon the important subject before the meeting.

Mr. SIMMONDS in thanking the meeting for the manner in which the paper had been received, said that he was enabled for the most part, from his own private collection, to illustrate all the ordinary gums and resins of commerce, but for some exceedingly fine samples and rare specimens, he was indebted to the kindness of Messrs. Rea, Wallis, D. Hanbury, jun., Walker, Harding, S. Hall, and Hemming.

The Secretary announced that the paper to be read at the meeting of Wednesday next, December the 5th, was "On the Construction of Private Carriages in England; and on the Carriage Department of the Paris Exhibition," by Mr. G. N. Hooper. On this evening the Earl of Shelburne, M.P., will preside.

To Correspondents.

The Secretary has been requested by the Chairman of the Council, to publish in the *Journal*, that the statement in his recent address to the Society on the opening of the Session, to the effect that Mr. Chadwick had been employed by the Emperor of the French to Superintend the Sanitary improvements in a quarter of Paris, was founded on a misapprehension.

MEETINGS FOR THE ENSUING WEEK.

MON. Royal Inst. 2. General Monthly Meeting.
London Institution, 7, Mr. John Ella, "On Music, Vocal and Instrumental."
Architects, 8. Adjourned Discussion on a Diploma in Architecture.
Chemical, 8.
Entomological, 8.

TUES. Civil Engineers, 8, Mr. Evan Hopkins, "On the Gold-Bearing Rocks of the World."
Linnæan, 8.
Pathological, 8.

WED. London Institution, 3, Mr. Robert Bentley "On the Reproductive Organs and Classification of Plants."
Society of Arts, 8, Mr. G. N. Hooper, "On the Construction of Private Carriages in England; and on the Carriage Department of the Paris Exhibition."
Geological, 8. 1. Mr. R. W. Banks, "On the Tilestones, or Downton Sandstones in the neighbourhood of Kington, and their Fossil contents." 2. Mr. D. Sharpe, "On the last Elevation of the Alps, with Notices of the Heights at which the Sea has left traces of its action on their sides."

THURS. London Institution, 7, Mr. W. Odling, "On the First Principles of Mechanical Philosophy."
Antiquaries, 8.
Photographic, 8.
Royal, 8½.

FRI. Philological, 8.

SAT. London Inst, 3, Mr. Thomas A. Malone, "On the Elementary Principles of Vegetable and Animal Chemistry."
Royal Botanic, 3¾.
Medical, 8.

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette November 23rd*, 1855.]

Dated August 29th, 1855.

1953. John Hanson, Doagh, Belfast—Improvements in machinery or apparatus for digging or working land, and removing roots or plants therefrom.

Dated September 6th, 1855.

2019. James Fraser, Jermyn-street—Improvement in the manufacture of paper.

Dated October 13th, 1855.

2291. John Durance, Barge-yard, Bucklersbury—Improvement in the frames of pianofortes.

Dated October 27th, 1855.

2398. Henry Wyatt, 58, Pall Mall—A peculiar apparatus for more rapidly and perfectly manœuvring or steering steam ships of war or of commerce, which is entiled The Transpulsor.

Dated October 29th, 1855.

2411. John Kennard, 32, Little Queen-street, Holborn—Improvement in the manufacture of childrens and invalids' carriages.

2413. Germain Jean Paul Marie Villeroux, Paris—Improvements in the manufacture of soap.

2415. John Henry Johnson, 47, Lincoln's inn-fields—Improvements in regulating the transmission of motive power. (A communication.)

Dated October 30th, 1855.

2417. Paul Emile Chappuis, 69, Fleet-street—Improvements in reflectors for the diffusion of artificial light.

2419. William Naylor, Norwich—Improvements in power hammers and rivetting machines.

2421. Thomas Hocroft, Tividale, and Richard Forrest, Tipton—Improvements in the manufacture of iron rods, bars, hoops, merchant and guide iron.

Dated October 31st, 1855.

2423. William Henry Walenn, 46, Regent-street—Self acting attachment to be applied to gates. (A communication.)

2425. James Gray Lawrie, Glasgow—Improvements in ship building, to facilitate the use of water as ballast.

2427. Henry Edwin Drayson, Maresfield Powder Mills, Sussex—Improvement in the manufacture of gunpowder.

2429. Thomas James Swinburne, South Shields—Improvements in furnaces or apparatus used in the manufacture of glass.

2431. Richard Pannell Forlong, Bristol—Improved manufacture of manure.

Dated November 1st, 1855.

2435. Henry Laxton, 19, Arundel-street, Strand—Improvements in gearing for increasing or decreasing rotary speed. (A communication.)

2437. George Milner, 13, Hollen-street, Wourdour-street, St. Ann's, Westminster—Improvements in the manufacture of bedstead

bottoms, part of which improvements are applicable to various other purposes for commercial and domestic use.

2439. William Taylor, Haughton, near Shifnal—Improvements in the manufacture of iron.

2441. Joseph Bentham, Bradford—Improvements in looms for weaving.

2443. Robert Keer, Glasgow—Improvements in spinning together fibrous materials of different kinds.

2445. William Henry Walenn, 46, Regent-street—Improvements in pianofortes. (A communication.)

Dated November 8th, 1855.

2518. Louis Gasté, 58, Paradis Poissonnière, Paris—Improvements in binding account and other books.

Dated November 9th, 1855.

2522. George Barry Goodman, and George Alfred Webster, 21, York-buildings—Improvements in apparatus for reflecting the back, front, and sides of the figure and head in a mirror or toilette glass at one view.

2524. James Bramwell, Royal Exchange-buildings, and John Crawford, Newcastle-upon-Tyne—Improvements in ordnance.

2526. Charles Joseph Hampton, Llynrivale, Llangynwyd, Glamorgan—Improvements in the manufacture of iron.

Dated November 10th, 1855.

2528. William Peter Piggott, 523, Oxford-street—Improvements in galvanic, electric, and electromagnetic apparatus, and in the mode of applying the same as a curative and remedial agent.

2530. Joseph Scott, Glasgow—Improvements in corking bottles, jars, and other receptacles.

2532. Alfred Vincent Newton, 66, Chancery-lane—Improvements in transmitting fac-simile copies of writings and drawings by means of electric currents. (A communication.)

2534. Henry Wickens, 4, Token House-yard, Bank—Improvements in locomotive steam engines, and in apparatus in connection therewith, parts of which improvements are respectively applicable to other steam engines and purposes.

Dated November 12th, 1855.

2536. Jules Cesar Alexander Bouillotte, Paris—Improved letter copying-press.

2538. William Kemble Hall, 36, Cannon-street—The prevention of steam boiler explosions.

2542. John Yull Borland, Manchester—Improvements in spinning, and machinery for preparing and spinning fibrous materials.

2544. Joshua Kidd, 75, Newgate-street—Improvements in machinery and apparatus for sewing or stitching and ornamenting cloth or other fabrics.

2546. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in casting metals. (A communication.)

2548. William Carr Thornton, and Benjamin Thornton, Cleckheaton—Improvements in machinery or apparatus for preparing and spinning wool, which improvements are also applicable to washing and wringing machines for the same material.

Dated November 13th, 1855.

2552. Julius Homan, Milk-street, Cheapside—Improvements in machinery for cutting up woven and other fabrics.

2554. William Webb and John Webb, junior, and James Catstree, Birmingham—Improvements in attaching door knobs to spindles.

2556. Frederick Abraham Eskell, Manchester—Improvements in plates for attaching artificial teeth.

2558. William Foster, Black Dike-mills, near Bradford—Improvements in machinery or apparatus for drying wool and other fibrous materials.

Dated November 14th, 1855.

2560. Henry Laxton, 19, Arundel-street, Strand—Improvements in fire-arms. (A communication.)

2562. Thomas Skinner, Sheffield—Improvements in producing figures or ornaments upon the surfaces of metals.

2564. Cyprien Marie Tessie du Motay, Paris—Improvements in the manufacture of lubricating materials.

2568. George Tomlinson Bousfield, Sussex-place, Loughborough-road, Brixton—Improved safety coal-hole cover. (A communication.)

2570. Edmond Godefroid Cox, Lille—Improvements in picking or cleaning cotton, wool, and other filamentous substances.

Dated November 15th, 1855.

2574. John Talbot Pitman, 67, Gracechurch-street—Improvements in the construction of iron beams and girders, and in machinery for making the same. (A communication.)

2576. Joseph Lester Hinks, Birmingham—Improvements in brushes.

2578. William Lea, Wolverhampton—Improvements in taps or cocks.

2580. Duncan Morrison, Bordesley Works, Birmingham—Improvements in the manufacture of articles with internal screws, when cast iron, malleable cast iron, or cast brass is employed.

WEEKLY LIST OF PATENTS SEALED.

Sealed November 23rd, 1855.

1157. Johan Jacob Meyer.
1165. William Smith.
1166. William Smith and Nathaniel Fortescue Taylor.
1167. James Atkinson Longridge.
1179. Joseph Addenbrooke.
1191. Frederick Herbert Maberly.
1193. Thomas Mather.
1200. Auguste Edouard Loradoux Bellford.
1202. Theodore Marie Rabbatte and Jacques Rettig.
1206. François Theodore Botta.
1252. Peter Armand le Compte de Fontaine Moreau.
1334. John Henry Johnson.
1398. John Macintosh.
1416. William Edward Newton.
1516. Julian Arnold Bellay.
1548. Joseph Wilson.
2002. Warren De la Rue.
2012. George Peacock.
2024. Richard Archibald Brooman.
2066. John Macintosh.
2132. Charles Manby and William Piper.

Sealed November 26th, 1855.

1213. John Morrison.
1215. Eugene Michel Roch.
1221. Henry Grafton.
1239. Emanuel Wharton.
1246. Samuel Bickerton.
1247. Antoine Bernard Alfred Baron Espiard de Cologne.
1270. Horace John Kaye and Percy Burrell.
1273. Edmund Morewood and George Rogers.
1275. William Edward Newton.
1283. Thomas Barrows.
1296. John Boucher.
1299. John Ramsbottom.
1319. Thomas Bright.
1321. Joseph Robinson.
1336. John Joseph Liebisch.
1349. Edward Rush Turner and Frederick Turner.
1355. George Arthur Biddell.
1358. Ebenezer Hollis.
1379. Louis Henri Real.
1418. John Louis Jullion.
1425. Richard Keevil.
1472. John Raywood.
1513. Richard Archibald Brooman.
1637. Mathieu François Isoard.
1877. Alfred Savage.
1985. James Timmins Chance and Henry Adcock.
1995. Cyrus Clark and James Clark.
2001. Charles Gustav Mueller.
2005. William Southwell.
2035. Thomas Hemsley and William Hemsley.
2057. Matthew Curtis and John Wain.
2061. John Macintosh.
2065. Benjamin Barber, John Butterfield, and Thomas Austin.
2077. George Dewdney.
2165. Thomas Barrows.

WEEKLY LIST OF PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

November 19th.

890. Mathurin Jean Prudent Moriceau.
1070. Clement Dresser.
1174. David Clovis Knab.

November 21st.

884. Robert Barnard Feather.

November 22nd.

847. Henry Thomson.
850. William Henry Winchester.
865. Charles Harford.
919. James Barlow.
939. James Newall.

November 23rd.

853. Stephen Spalding.
867. Charles Ilee.
983. John Henry Johnson.
985. William Mayo.
991. Thomas Lovell Preston.

November 24th

870. James Ward Hoby and John Kinniburgh.
887. Thomas Wood.
942. Peter Walker and Andrew Barclay Walker.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3786	November 22.	Solocorun	Key and Co.	Charing-cross.
3787	,, 26.	Gas Torch	James Jones and Son	Bow street, Covent-garden
3788	,, 27.	Perpetual Office Almanack	Francis Jackson	Derby.
3789	,, ,,	Part of a Photographic Camera	Arthur James Melhuish	Blackheuth.
3790	,, 28.	Clasp Fastening	Turner and Pegg	Leicester.